Chemical Industries

mber 1948

IN THIS ISSUE

NEW DEVELOPMENTS SPUR TONNAGE TRANSPORTATION p. 772

Cover: Installing acid tanks in barge

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Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 63 — NUMBER 5 NOVEMBER, 1948

DEPARTMENTS

NEWS OF THE MONTH

Chemical Industries is indexed regularly by Engineering Index, Inc. and Industrial Arts Index.

Cover: Dravo Corp.

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A MACLEAN-HUNTER publication, Horace T. Hunter, President

THE READER WRITES

Flower Preservation With Latex

To the Editor of Chemical Industries:

In the article "Chrysanthemummies" on page 214 of your August issue it is stated that Drs. Philip and Sidney Joffe found Goodrich's latex emulsion to be inferior to a methacrylate coating for preserving flowers.

With reference to this statement, may we submit the following facts:

Our product has not been announced as a commercial material for biochemical applications, nor have we released any publicity to this effect. This material is an experimental product for which only data gathered by Michigan State College have been published. Messrs. Sherwood and Hamner of the Michigan State College Horticultural staff stated in the introduction of an article, page 272, volume 30, #3 of Michigan Agricultural Experiment Station Quarterly Bulletin (February, 1948) that, "this material has proved useful in lengthening the life of certain flowers and floral greens as reported in the following paragraphs." To the best of our knowledge, no one skilled in the techniques of vinyl resin latices has attempted to permanently preserve cut flowers with the material, and thus it cannot be said factually or categorically that the product "failed" either on its own or in comparison with other materials.

This product, however, shows extremely interesting possibilities for lengthening the useful life of certain cut flowers as well as for a great variety of other horticultural applications. Publicity is now planned for the near future.

J. F. Moriarty
B. F. Goodrich Chemical Co.
Cleveland, Ohio

Phenol Correction

To the Editor of Chemical Industries:

This will call your attention to certain errors in the article, "Phenol—Part 2: Cost of Production," authored by R. F. Messing and myself which appeared in your August issue.

1. Page 235, column 1, paragraph 2, line 20, sentence incomplete, should read "if profitable outlets for these by-products exist."
2. Page 235, column 2, paragraph 2, line 10, should read, "an overall yield of 92% on conversion is believed to be representative."
3. The type in the chart comparing the production costs via the four processes for phenol synthesis has become badly pied.

William V. Keary
Arthur D. Little, Inc.
Cambridge 42, Mass.

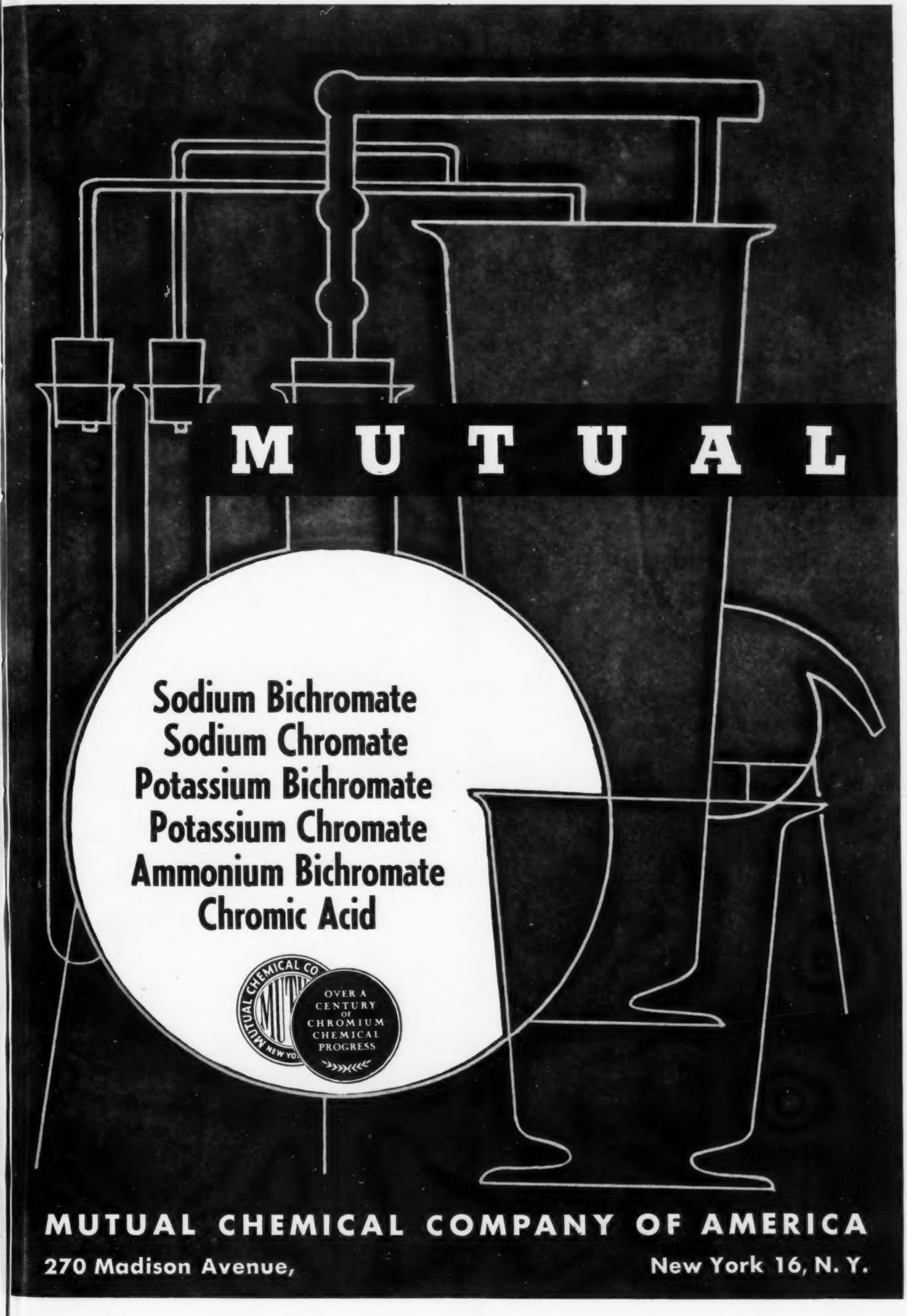
The corrected chart comparing costs of production by the various methods of synthesis is shown below.—Ed.

Production Cost Comparison for Synthetic Phenol
Plant Capacity — 15 million pounds per year

Process	Sulfonation	Raschig	Chlorbenzene With Production of By-Products*	Chlorbenzene With Min. By-Products*
Plant Investment (at present cost)	$3,000,000	$3,500,000	$3,100,000	$3,100,000
Raw Material Costs (at present quoted prices)	2.49¢/lb.	2.44¢/lb.	3.00¢/lb.	2.43¢/lb.
Benzene @ 20¢/gal.	1.39	—	—	—
Sulfuric Acid @ 1¢/lb.	2.85	.04	—	—
Caustic Soda @ 2.5¢/lb.	.02	—	—	—
Sulfur @ 1¢/lb.	—	—	.15	.10
Rock Salt @ 1¢/lb.	—	.39	.01	.01
Hydrochloric acid (33%) @ 2.5¢/lb.				
	6.75¢/lb.	2.87¢/lb.	3.16¢/lb.	2.54¢/lb.
By-Product Credits (for crude materials)				
Sodium sulfite @ 3¢/lb.	4.02	—	—	—
Crude Dichlorbenzene @ 3¢/lb.	—	.30	.40	.13
Phenol Residues @ 3¢/lb.	—	.06	.05	—
Diphenyl oxide @ 10¢/lb.	—	—	.87	—
	4.02	.36	1.32	.13
Net Material Cost	2.73	2.51	1.84	2.41
Labor @ $1.75/hr.	.72	.61	.67	.61
Utilities	1.05	1.18	1.35	1.24
Maintenance	1.60	1.16	1.03	1.03
Taxes, Ins., & Fixed Charges	1.00	1.16	1.03	1.03
Overhead & Supervision	.36	.30	.31	.31
Total Production Cost ex depreciation	7.46	6.92	6.23	6.63
Depreciation at 10%/yr.	2.00	2.32	2.06	2.06
TOTAL PRODUCTION COST (*exclusive of sales expense, etc.*)	9.46¢/lb.	9.24¢/lb.	8.29¢/lb.	8.69¢/lb.

**Polychlorbenzene, diphenyl compounds*

***Utilities Cost*
Power (for misc. equipment)—$0.01/KWH
Power (for electrolysis)—$0.005/KWH
Cooling water—$0.03/1,000 gals.
Steam—$0.55/1,000 lbs.
Fuel—$0.1/million BTU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Life ...on the

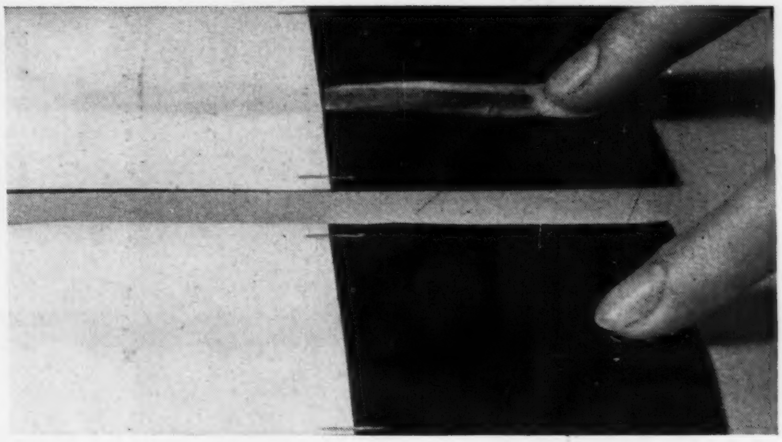
BIG STEP FORWARD in manufacture of urea-formaldehyde thermosetting plastics was made when Cyanamid recently introduced a new type faster-curing molding material known as BEETLE* Medium Fast-Cure. This new material will cut production costs on hundreds of plastic items like those shown above by reducing the normal molding time as much as 45% to 68% below that required for standard urea materials. In some tests, production increases up to 89% were achieved. This new plastic is the result of more than three years' experimentation and evaluation to improve further the quality and working properties of Cyanamid's Beetle Plastic.

A NEW, FASTER-DRYING RESIN for surface coatings has recently been developed by Cyanamid's Coating Resins Department. Known as CYCOPOL† S 101-1, it is a styrenated alkyd, the first of a series of new copolymer resins. It is especially adapted for use in low-cost industrial finishes and in fast-drying household enamels, combining excellent color and gloss with good adhesion and film properties. CYCOPOL S 101-1 is an outstanding research development and an important addition to Cyanamid's extensive line of Synthetic Resins for Superior Surface Coatings.

Chemical Newsfront

TIRE ON THE LANDING GEAR which was tried out on an experimental prototype of the new B-36 bomber stands higher than a man, as the above picture shows. But regardless of size, most tires owe their resiliency to the rubber itself; toughness, long life, and other characteristics must be imparted by the use of chemicals and other materials.

Cyanamid has long been an important supplier to the Rubber Industry of processing aids, vulcanizing agents, accelerators, activators, and organic chemical intermediates.



IMPROVED WET-RUB RESISTANCE in starch-pigment paper coatings has been achieved by Cyanamid's new PAREZ* Resin 611, a melamine-formaldehyde resin. In photograph above, note how coating on bottom sheet, to which resin has been added, remains rub-proof, while untreated coating on upper sheet rubs off.

STATIC ELECTRICITY, which hitherto has hindered production of many textile yarns and fabrics, is minimized by pre-application of Cyanamid's AEROTEX† SOFTENER H. Although this product was originally developed to impart softness and suppleness to both natural and man-made fabrics, it has been found that it increases handling and "boxing" efficiency in the mill by eliminating "fabric floating" and the annoyance of electric shock, even in the case of the vinylidene chloride type.

*Reg. U. S. Pat. Off. †Trademark

AMERICAN *Cyanamid* COMPANY

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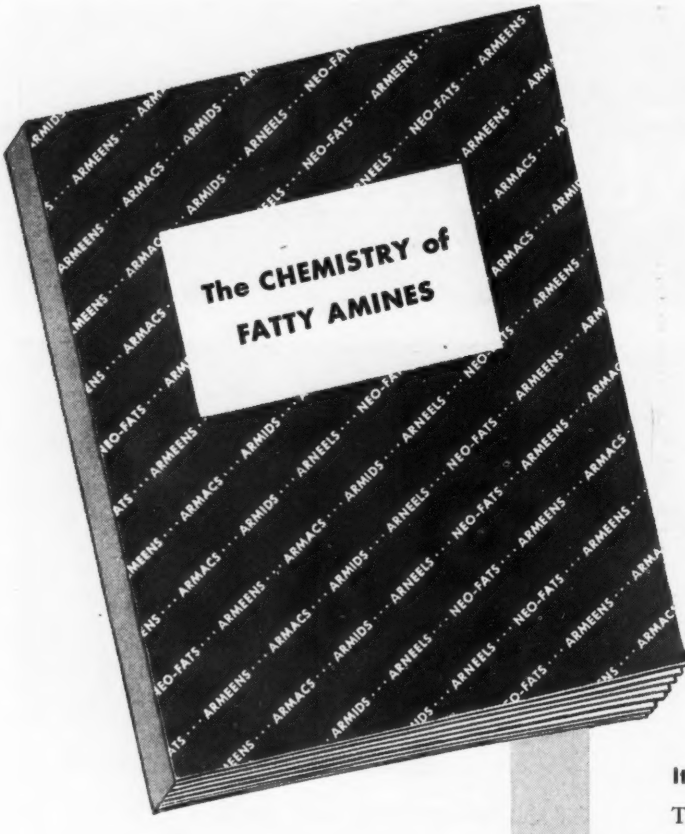

recommended reading for research chemists

It's authoritative . . . concise . . . available free!

Today, after years in research laboratories, the fatty amines are commercially available. As a result, chemists are now eyeing them with renewed interest and every day new applications for these versatile newcomers are being discovered.

To satisfy this growing curiosity and awareness, Armour is offering research chemists a detailed 24-page technical bulletin entitled "The Chemistry of Fatty Amines." This concise, informative booklet describes the nature, properties and reactions of the fatty amines.

Just what are fatty amines? They are organic bases or "alkalies" made from fatty acids. Many of their desirable features are inherited from ammonia—for the fatty amines are substituted ammonias and retain most of the reactivity of that compound. Judicious breeding has added many new, advantageous characteristics. Still other desirable properties are imparted by the long, normal alkyl groups derived from their parent fatty acids.

What are their uses? The Armeens, Armour's fatty amines, are already widely used in such diverse commercial applications as ore flotation reagents, germicides, cationic emulsification, asphalt bonding, pigment grinding, synthetic detergents, chemical intermediates, and as penetrants and repellents.

Table of Contents includes:

Types of Fatty Amines . . . Synthesis of Fatty Amines . . . Saturated Fatty Amines . . . Unsaturated Fatty Amines . . . Vapor Pressure of Fatty Amines . . . Solubility of Fatty Amines . . . Handling The Fatty Amines . . . Quaternary Ammonium Salts . . . Chemical Reactions of Fatty Amines . . .

Coordination Reactions of the Fatty Amines (Hydration, with Mineral Acids, with Organic Acids, Formation of Metal-Ammino Complex Ions, Coordination of Alkyl Groups by Tertiary Amines, Tertiary Amine Oxides)

Substitution Reactions of the Fatty Amines (N-Alkylation, Acylation, Reactions with Aldehydes and Ketones, Reactions with Nitrous Acid, Oxidation, Pyrolysis, Guanidines)

Cationic Surface Activity

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FACTS WORTH NOTING

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Unusually High Melting Point (2600° C)

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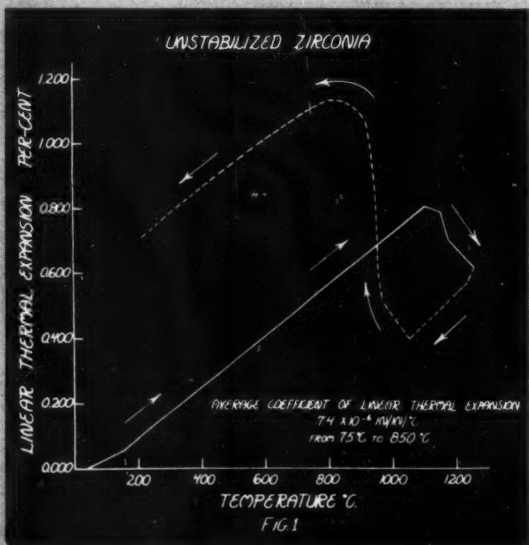
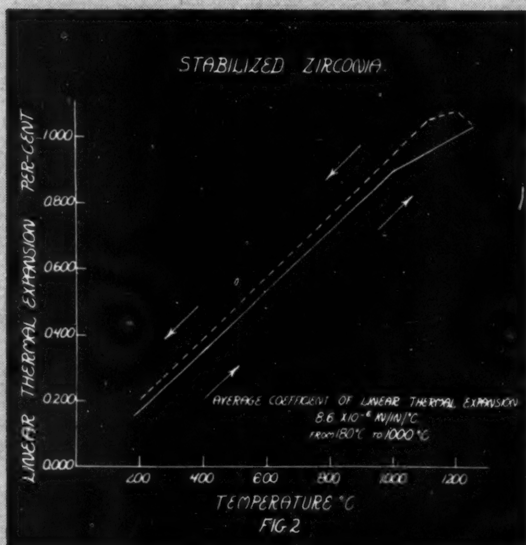
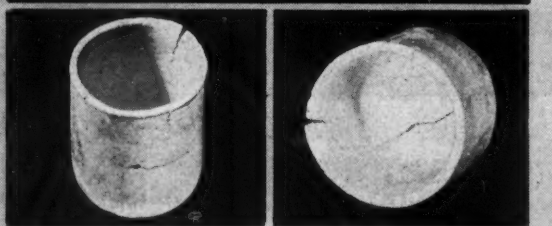
Possessing chemical stability, hardness and resistance to chemical attack, stabilized zirconia is even more exceptional because of its excellent resistance to thermal shock. These properties make stabilized zirconia crucibles ideally suited to the melting of precious metals such as platinum and high melting point super-alloys. They offer excellent possibilities in other applications. More detailed information may be secured from TAM research and engineering staffs or by writing direct.

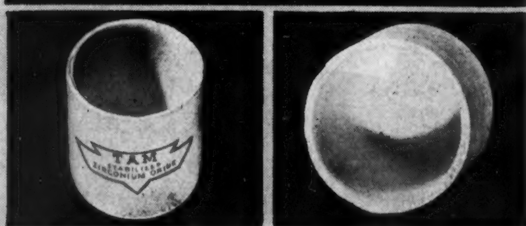
COMPARATIVE CHARTS POINT UP ADVANTAGES







Unstabilized crucible cracked badly after one cycle of air quenching from 15 minutes at 2800° F.



Crucible of stabilized zirconia did not fail after more than 20 such cycles.

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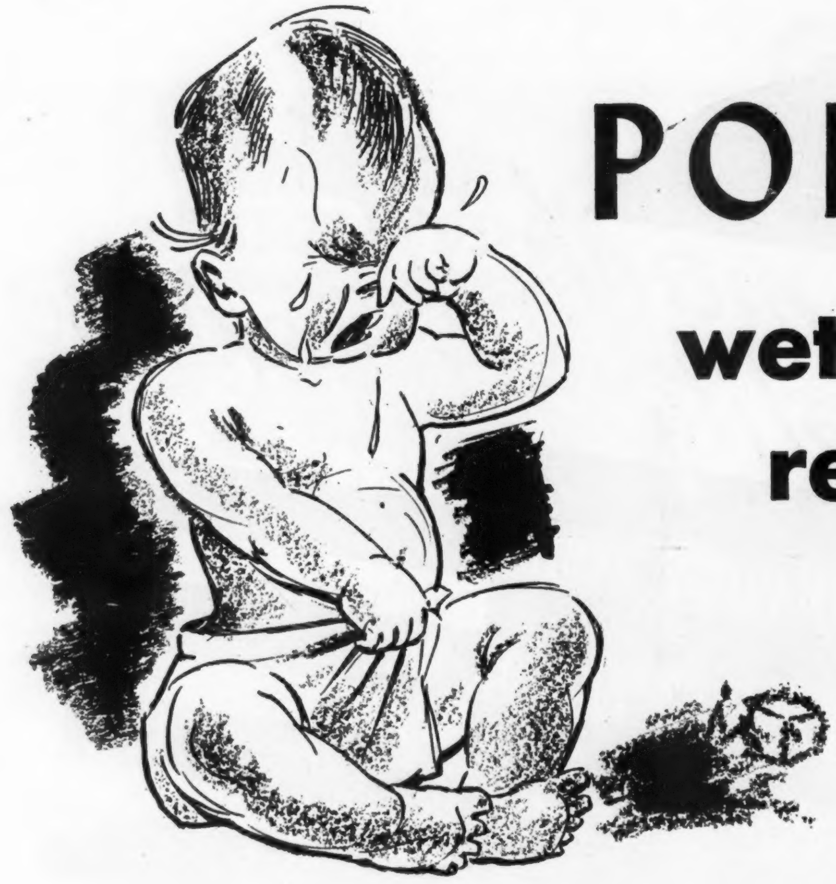

POLYCEL®

wets down readily

Polycel wets down readily and possesses excellent suspensibility in the solution. This outstanding suspension property eliminates the problem of a rapidly settling filteraid clogging the tank outlet. It also permits greater contact with the solution, retaining its uniform particle distribution which ultimately effects the efficient formation of the filter cake through even distribution in the filter press.

Polycel filter cakes are firm and felt-like and make the removal of the cake from the filter an easier function. Being cellulosic in nature it will burn, thereby easing the disposal problem.

Polycel is versatile — it is already being used advantageously in the filtration of molasses, sugar solutions, titanium, electroplating solutions, antibiotics, waxes, hydrogenated oils, catalyst filtration, essential oils, scrap candies, etc. If one of these suggests a use of Polycel in your filtering processes, write today for complete technical data.

Polycel, purified wood cellulose fiber, is produced in bleached and unbleached form in four grades varying in fiber length: Fluff, 20, 40 and 80 mesh.

OTHER PRODUCTS: *Snow Top Precipitated Calcium Carbonate • Nuchar Activated Carbons • Liqro Crude Tall Oil • Indusoil Distilled Tall Oil • Tallene Tall Oil Pitch • Tallex Abietic Acid • Sulfate Wood Turpentine • Alpha Pinene • Beta Pinene • Indulin (Lignin)*

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FOR YOUR INFORMATION

new booklet contains useful information on Monsanto Benzoic Acid and Benzoates

Of the hundreds of Monsanto Organic Chemicals that serve industry, the medical profession and the business of everyday living, few have so many diversified uses as Monsanto Benzoic Acid. The acid, its metal salts, and its combinations with other organic compounds have important applications — ranging from the preservation of food to a wide variety of uses in the plastics and surface coating industries.

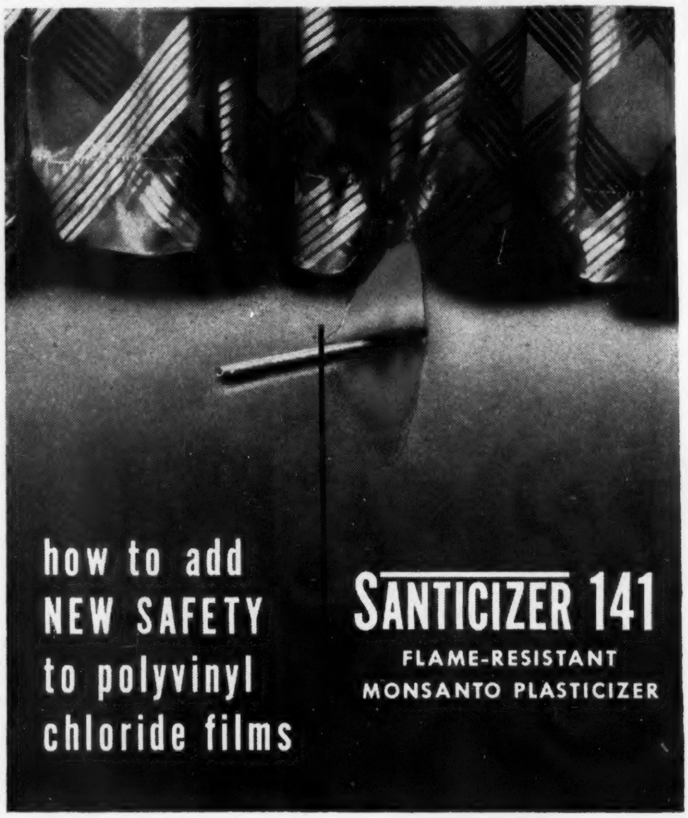
Interesting information on the profitable employment of Monsanto Benzoic Acid and its derivatives in many fields is contained in a new 20-page illustrated booklet, "Benzoic Acid and the Benzoates." Write for your copy today . . . or, ask for it on the convenient coupon.

Monsanto subsidiary leads in manufacture of veneer and plywood equipment

Identifying the finest veneer and plywood equipment for nearly 75 years, the Merritt name plate is a familiar hallmark throughout this important industry. It is a trade name with a reputation for engineering skill — appearing on lathes, clippers, driers, presses, jointers and many other types of special veneer handling equipment. Maximum efficiency, long life, ease of operation and economy of maintenance are qualities which distinguish all special machinery bearing this identification.

Now a Monsanto subsidiary, Merritt-Monsanto Corporation continues its leadership not only in the production of custom-made equipment, but as manufacturers' representative for a broad line of products allied with the plywood and veneer industry.

Two new catalogs — one showing the complete line of Merritt-Monsanto clippers, the other describing equipment for which Merritt-Monsanto acts as manufacturers' representative — are available on request. If you would like copies, write to Merritt-Monsanto Corporation, Lockport, N. Y.



By incorporating Santicizer 141 in polyvinyl chloride films you can achieve flame-retardant qualities without sacrificing flexibility or drape. This superiority is proved by a comparison of burning rates — Santicizer 141 flames out in *1 second flat,* while other equally efficient plasticizers have a minimum burning rate of 38 seconds.

In addition to this vital safety factor, Santicizer 141 has many other advantages as a plasticizer for vinyl compositions used in curtains, upholstery materials, tablecloths, floor tiling, wearing apparel and a wide variety of similar products. Briefly stated, Santicizer 141 offers you the following important processing and performance values:

Exceptionally low burning rate • Low toxicity • High compatibility with vinyl resins • Low volatility • Softness and drape Resistance to weathering • Strength, elasticity, abrasion resistance Good low-temperature flexibility.

Since Santicizer 141 will soon be available in commercial quantities, send now for samples, application and technical data. Write, or simply note your request on the coupon.

Santicizer: Reg. U. S. Pat. Off

COMPARATIVE "FLAME-OUT" TIME

Santicizer 141 vs. two similar plasticizers

SANTICIZER 141....	1 SECOND
PLASTICIZER A....	38 SECONDS
PLASTICIZER B.....	44 SECONDS

News of Monsanto Chemicals for the Process Industries . . . November, 1948

AROCLORS

low-cost, high-efficiency co-plasticizers or resins

SURFACE COATINGS

If you are interested in low-cost co-plasticizers or resins of high efficiency for use in surface coatings, you will find cost and product advantages in Monsanto AROCLORS (chlorinated biphenyl and chlorinated polyphenyls). These mobile, viscous resins and solids impart desirable characteristics of toughness, adhesion, corrosion resistance, water resistance and good weathering qualities to such products as:

RUBBER BASE PAINTS... **Parlon, Pliolite, vinyl coatings and marine paints.**

LACQUERS... **Nitrocellulose, ethyl cellulose, cellulose aceto butyrate and polystyrene.**

VARNISHES... **Quick-drying.**

VINYL RESIN PASTES, ORGANOSOLS AND PLASTISOLS... **For coating fabrics and paper.**

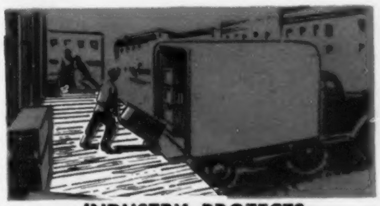
ADHESIVES... **Vinyls, Vistanex, rubber base, ethyl cellulose and polystyrene.**

WOOD PRESERVATIVE SEALERS... **Good paintability and finishability.**

In addition to the above, the AROCLORS have many other applications, among them being electrical materials and equipment, hydraulic pressure medium, soil poisoning, expansion medium, liquid heat transfer medium and high-temperature lubrication.

Technical assistance will be furnished in connection with any problems involving the use of the AROCLORS. These technical bulletins are available — No. P-114, "The AROCLORS" ... No. P-124, "AROCLORS as Used in Chlorinated Rubber" ... No. P-126, "AROCLORS as Used in Pliolite S-5."

Write MONSANTO CHEMICAL COMPANY, Phosphate Division, outlining your specific problems, or return the coupon if more convenient. *Aroclors: Reg. U. S. Pat. Off.*



INDUSTRY PROTECTS INVESTMENTS IN WOOD

PENTACHLOROPHENOL

(Monsanto's Santophen 20)

Industry is turning more and more to the use of pentachlorophenol to safeguard its huge investments in wood. The demonstrated ability of pentachlorophenol to prolong the life of poles, crossarms, posts, bridge and platform decking and other wood structures cuts wasteful expenditures for maintenance and replacement — amply repays its low original treating cost.

Properly applied, Santophen 20 prevents damage caused by termites, rot and fungus growths. Its killing power is always laboratory-controlled — therefore always constant. This is your assurance of long-lasting, dependable protection.

For latest application and technical data on Santophen 20, write, or simply return the coupon.

SOME MAJOR INDUSTRIAL APPLICATIONS FOR SANTOPHEN 20

Structural Timbers (bridge decking, loading platforms, roofs, water towers)
Dimension Lumber (framing, joists, rafters)
Millwork (trim, exterior finish)
Transmission Lines (poles and crossarms)
Fences (posts and rails)

Santophen: Reg. U. S. Pat. Off.

* * *

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
November, 1948.

For Your Information:

Humble Oil Co. is producing cyclohexane from petroleum at Baytown, Texas. Du Pont has successfully used cyclohexane on a test scale to produce adipic acid at its Sabine (Texas) Works for nylon manufacture.

The new Phillips Chemical Co. ammonium sulfate plant at Houston, Texas, will start operating about the first of the year. The 200,000 tons-per-year capacity of the plant will make it the largest in the country.

* * CI * *

Davison Chemical Corp. is planning to extend the line of its Automotive Products Division to include a body wax. Principal product of the Division at presentis a body-undercoating material.

Celanese Corp. is now producing pentaerythritol on a pilot-plant scale; full-scale production is expected by late '49. Celanese's Chemical Division already makes the two raw materials: formaldehyde and acetaldehyde.

* * CI * *

J. R. Simplot, Idaho fertilizer manufacturer, is still pursuing plans for production of ammonium phosphate in Salt Lake City (CI Newsletter, June, 1948). He is currently attempting to interest a major chemical company in taking over the wartime Kalunite alumina plant there and making necessary alterations for phosphate production. If the deal goes through, Simplot will supply the phosphate rock and the chemical company the ammonia.

Northern Alberta will have a five-ton-per-day chlorine plant if the promoters can find suitable backing. The site will be Lindbergh, which already has a salt plant, partly owned by two oil companies, and power facilities; but its location has discouraged some prospective investors.

* * CI * *

Owens-Illinois Glass Co. is developing an improved, faster

method of firing colored patterns into glass goblets, cocktail glasses, etc. Secret of the process: a mixture of organic compounds which acts as a low-melting vehicle for the pigments, burns off carbon-free at a temperature well below the softening point of the glass.

The first large U. S. producer of sulfuric acid in the Pacific Northwest will be the American Smelting & Refining Co., which is building a 100-ton plant at its Tacoma works. The plant, to be completed early in 1950, will utilize currently-wasted stack gases. The only other plant in the vicinity, outside of Consolidated Mining & Smelting at Trail, B. C., is Du Pont's 35-ton operation at its Fort Lewis powder works.

* * CI * *

A new company, Processed Surfaces, Inc., is test-marketing a silicone solution for household use. Called Pantastic, it is applied to cooking utensils to eliminate the use of scouring powders or detergents in cleaning. Another big advantage: greaseless cooking for those who can't eat or don't like food cooked in fat. The product is the outgrowth of research on minimizing carbon deposition in internal-combustion engines.

Central Equipment Co., Chicago, is test-marketing its Champ Home Deodorant in the Peoria, Ill., area. If the testing is successful, national distribution will follow. Feature of the 6-oz. carton (which sells for 49¢): it may be used as a pump gun to dispel odors rapidly, or simply allowed to stand open.

* * CI * *

Here and There:

Production of ethylene glycol at Jefferson Chemical Co.'s new Port Neches, Texas, plant is running about 50% ahead of the rate anticipated for this time at the first of the year . . . Attendance at the National Chemical Exposition in Chicago last month was below expectations numerically; but most exhibitors were pleased with the quality of the crowd. Individual companies sent fewer representatives than in previous postwar years, but those who did come were there for business. One exhibitor brought a representative of its plant union to let him see what kind of competition his company was up against . . . A patent (U.S. 2,444,567) assigned to Polaroid Corp. describes reproduction in multicolor in carriers sensitized with ferric salts . . . The well-advertised germicidal additive in Armour's Dial soap and in Gillette's shaving cream (Compound K-34) is G-11, or bis-(3,5,6-trichloro-2-hydroxyphenyl)-methane, marketed by Sindar Corp., Givaudan-Delawanna's industrial subsidiary . . . Trenton Chemical Co., Trenton, Mich., is undergoing a reorganization and is already back in operation on production of ethyl alcohol. It is also considering monosodium glutamate.

The Editors

A PROBLEM AND A PLAN

by ROBERT L. TAYLOR, Editor

THE OTHER DAY we were having lunch with a friend who is connected with a paint company, and he made this comment:

"Our business is better, we've got more money in the bank, but we are doing more worrying about the future than we've done in years."

Unlike learning, a little worrying is not always a dangerous thing. There is some "worrying" about the future going on in the chemical industry today, and some of it is resulting in precautions which will strengthen the industry's ability not only to weather, but help dissipate, any impending economic storms.

The precautions that are being taken assume many forms. We would like to tell you about one in particular that we believe is a bit unique and which seems to us to be especially constructive and sound. It is unfortunate that we are not at liberty to divulge the name of the company concerned, but we can say that it is one in which the management and directors have long had a deep appreciation of the value of research in keeping their organization in the fore of progress in its industry. Here is the story, in the approximate words of one of the company's officers:

"Our board has authorized us to begin making studies for our next program of major expansion and the introduction of new products which will involve major capital expenditures. We hope that we will be able to make these expenditures during the next recession, when costs may be somewhat less than they have been in this very difficult period through which we are passing.

"Whether we will have the courage to go ahead then is something else again. At the bottom of depressions when costs are low no one has either the courage or the capital to go ahead.

"It was with this in mind that more than a year ago, at a time when interest rates were the lowest in our history, I made arrangements on a rather new pattern for borrowing $25,000,000 on a standby basis from two of our largest insurance companies.

"Having served on the board of directors of an insurance company, I knew the problems that confronted these companies in finding outlets for their constantly accumulating funds, and their need for three per cent on their assets that were invested in government bonds.

"I therefore asked for a standby arrangement for five years. I told the insurance companies that under present conditions it took from one to two years to build a plant after we decided to go ahead, and that at least another year was required to get the plant into production and turning out goods at anywhere near capacity.

"Thus I did not want to begin amortizing the money borrowed during the first three years after I borrowed it. Then I wanted another fifteen years to amortize the debt, with the privilege of paying it off at a faster rate if the plants in which the money was invested were earning sufficient profits to enable us to write off the debt in a shorter time. For this privilege of having $25,000,000 of standby money, I agreed to pay one-half of one per cent for any portion of the amount that I did not borrow during the five-year period. The interest rate for the borrowed money amounted to less than three per cent.

"With this standby arranged for in boom times, I sincerely hope that we will have the courage to make use of it if we have a recession or depression."

As it exists today the chemical industry depends for its lifeblood on continuing research combined with capitalization of research results into commercial realization. Also, as we move into the age of synthetics at an increasingly rapid rate, the industry cannot relax its expansion activities for long, or growing demand will again overtake it.

Thus a continuation or worsening of the shortage of new equity capital, which seems a likelihood in view of present and probable future tax policies, could easily hit the chemical industry a solar plexis blow, especially if there should be a recession. We believe the plan outlined by our friend above is one of the most intelligent we have heard for avoiding such a catastrophe. It not only provides capital when it is needed, but actually imposes a penalty if it is not used.

Chemical Industries

NOVEMBER, 1948

What's new

BUTANOL MERRY-GO-ROUND

Price drop of fermentation n-butanol is the newest chapter in an up-and-down history, makes it again competitive with the synthetic material.

LATEST in the many gyrations of the *n*-butanol industry is a precipitous drop in the price of the fermentation product—from 32c per pound to 17.5c per pound. With this reduction, it again comes into complete competition with the synthetic material after a lapse of five years—a lapse due primarily to the synthetic rubber program. Ethyl alcohol, which is produced by a different type of fermentation from the same raw materials, was needed in large quantities to make butadiene for rubber. This abnormal demand plus other war-induced pressures on available supplies of carbohydrate raw materials pushed up prices on molasses, the source of fermentation butanol for some years before the war, and forced resumption of manufacture from the more expensive grains, usually corn.

The recent price reduction can be attributed to another of those war-born anomalies: the parity system for support of farm prices. Under it, the government must support the price of potatoes at \$1.50 per bushel. However, surplus potatoes are a bit difficult to store from one season to the other and the government has been forced to dispose of them—in this case by sale at a price of 15c per bushel. Since this is ten cents less than the cost of transporting the potatoes to the plant (Uncle Sam pays for that service, too), the flour producers have cause for joy. With their flour as the raw material in the fermentation vessels of at least one of the three butanol producers, the alcohol price had to soften.

Synthetic Rubber

Interestingly enough, the first production of *n*-butanol dates back to one of the earliest attempts to produce synthetic rubber. A butanol plant began production in England in 1913 to provide the raw material for butadiene.

In the meantime World War I started, and huge quantities of acetone were required by the English for production of cordite, a blend of nitrocellulose and nitroglycerine. Although acetone was a minor constituent of the fermentation yield, the butanol process was a source that promised a readily expandable supply. Production was increased in England—until the supply of raw material dried up—and then in Canada and India, and eventually in the United States.

U. S. Production

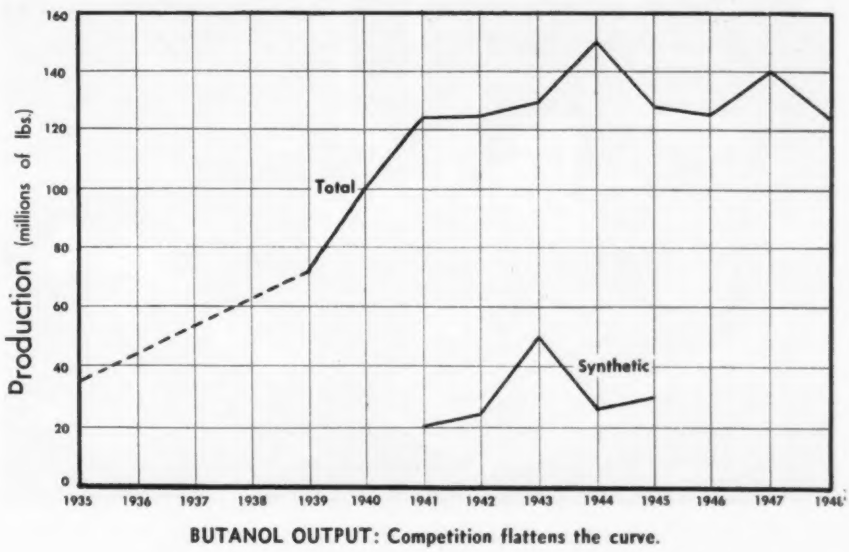
After the United States entered the war in 1917, Allied government agencies purchased two distilleries in Terre Haute, Ind., and converted them from ethanol production to the British fermentation process for acetone. Large quantities of *n*-butanol were obtained in the process, and when the Armistice closed operations, disposal of this "white elephant" posed a problem. A combination of Prohibition and the growing demand for a fast-drying finish for mounting numbers of automobiles coming off assembly lines supplied the solution. Large quantities of solvent were needed for nitrocellulose lacquers; and the amyl acetates, produced from fusel oil remaining after ethanol distillation, were suitable. However, the bootleggers, who took care of the nation's drinking alcohol wants, did not recover them and attention was focused on the butanol that had been kicking around. It was discovered that butyl acetate was an excellent lacquer solvent—so good that this is still one of the most important end uses of butanol.

Commercial Solvents Corp., which had operated the Indiana plants during the war and eventually purchased them, started butanol production in 1920, the true birthday of the industry in the United States. Later operations were transferred to Peoria, Ill., where butanol is still being made. It is of interest to note that the process operated first on corn, then on molasses, and then reverted to corn during and since the second World War.

Eventually two other companies began the production of *n*-butanol by the fermentation process: Publicker Industries, Inc., at Philadelphia, Pa., and U. S. Industrial Chemicals, Inc., near New Orleans, La., and at Curtis Bay, Md.

Synthetic n-Butanol

Dec. 29, 1931, is a red-letter day in the butanol industry: that was the date of the first tank-car shipment from the new South Charleston, W. Va., plant of Carbide and Carbon Chemicals Corp. Initial capacity was reported to be 15 million pounds per year, a sizable portion of the market existing at that time. An additional unit has since been installed at



BUTANOL OUTPUT: Competition flattens the curve.

Texas City, Texas, and in 1943, the company's total production hit 50 million pounds.

Ethylene is the raw material for this synthesis. It is first hydrated to ethanol by use of sulfuric acid. This product is dehydrogenated to acetaldehyde which is aldolized, presumably to crotonaldehyde. Hydrogenation of the crotonaldehyde yields the desired *n*-butanol.

Any comments on the future of the *n*-butanol industry are muddled by the same confusions that exist concerning the future of ethanol. Synthetic *n*-butanol is produced from synthetic ethanol, and fermentation *n*-butanol is produced by fermentation of the same carbohydrates required for fermentation ethanol. A further question poses itself: Will the large quantities of acetaldehyde from direct oxidation of ethane (McCarthy Chemical Co.) and propane and butane (Celanese Corp.) be used for the production of *n*-butanol?

n-Butanol stands out as one of the few chemicals produced in large volume (100 million pounds per year) before the last war that has not undergone a tremendous expansion since 1940. A very important reason for this is that butanol made by known processes, even after this last price reduction, commands a unit price that is relatively high for a hundred-million-pounds-per-year product. This has invited strong competition by other materials for most of its end uses. For the same reason, it would be expected that less expensive, alternate syntheses would have been developed. They haven't, although it is understood that appreciable quantities of *n*-butanol are found in the butanol fraction which Celanese is marketing.

Whether or not the government continues to provide windfalls to the fermentation producers, it would seem that synthetic *n*-butanol will determine the price level of the *n*-butanol market.

EMULSIFIER SELECTOR

New system simplifies selection of a surface-active agent for a given job.

THE CHEMIST who has been faced with the task of selecting the best surface-active agent, or combination of agents, for a given problem from among the thousands of such agents and their combinations that are available, knows what a mountainous order this is. Anything that can simplify the job is good news indeed.

A new system which promises to do this has been developed by Atlas Powder Co. and is described for the first time in a 74-page Atlas technical brochure on surface-active agents that came off the press last month. (Distribution is limited by the company to those directly concerned with surface-active applications.)

Water-Oil Balance Is Key

The system is based on the hydrophile (water-loving) lipophile (oil-loving) balance of a surface-active agent. Each agent has its own characteristic hydrophile-lipophile balance (HLB), which is a direct indication of the type of emulsion it will make. Moreover, one specific HLB will be found best for each use to which a surface-active agent is likely to be put.

Thus the process of selection becomes one of matching HLB numbers. Sounds simple, doesn't it? It is, compared with the older methods of 100% cut and try, but to make it so, Atlas had to develop a way of expressing HLB's numerically. It has done this and has assigned HLB values to all of its own surface-active agents. It hopes eventually that the system may be adopted by other manufacturers so that selection of such agents can be made simpler on an industry-wide basis. In anticipation of this it is in the process of further refining its method of HLB number determination.

Atlas is quick to point out, however, that the HLB system is neither an absolute nor an automatic selector, but rather serves to narrow down the field of choice. Within the indicated HLB ranges there is still need for preparation of trial emulsions, as the eligible agents are likely to vary widely among themselves in such properties as viscosity, specific gravity, color and solubility. Where these other properties indicate that a combination of agents might be desirable, theHLB of the combination can be determined on a direct weight-percentage basis to see if it falls within the indicated range.

In addition to HLB values for the Atlas series of surface-active agents, the Atlas brochure includes a table showing the generally required HLB for over 20 common uses and indicates optimum HLB requirements for a large number of specific formulas.

CSC BUTANOL PLANT: Synthetic exerts a pressure.

STARCH WITH STAMINA

New resin finishes confer a permanent starch-like stiffness to cotton fabrics.

THE CLEAN crispness of a freshly laundered and starched shirt is a delight to behold; but like many transient beauties of this world, it all comes out in the next wash.

Now textile chemists of several companies are countering the impermanence of starch with the durability of resin finishes. Most of the materials developed so far are sold only to textile processors; but at least one product, Perma-Starch, manufactured by the National Textile and Chemical Laboratories, is being sold over the counter to housewives. The Textile Resin Department of American Cyanamid Co. has developed several finishes based on urea- and melamine-formaldehyde resins: Lacet, a melamine condensate in combination with other resins and pigments, is especially designed for cotton or rayon lace curtains. Sheerset finish is another melamine-based resin for cotton and rayon sheer-woven fabrics. Aerotex Cream 450 is a similar material based on urea-formaldehyde.

No Cure Necessary

Latest entrant in the field is Polyco 337, manufactured by American Polymer Corp. Available as a 30% dispersion in water, this new finish is a fully polymerized tripolymer that—unlike urea or melamine resins—requires no curing operation.

Application is made by immersing the fabric in a water bath containing 2 to 5% of resin solids and drying at room

COTTON FROCK: Crispness survives the tub.

temperature or higher. The final stiffness desired determines the quantity of resin used. Normal calendering or ironing temperatures are sufficient to set the resin in the fabric; and such setting takes place simply by evaporation of the water and fluxing of the dried film. Standard padding machines are used for mill application and drying ovens at moderate heat—up to 220° F.—set the material permanently. The resin film is water-white, does not alter or fade dyes, and doesn't discolor or become brittle with age.

Three-Year Job

The gestation period of the new finish was longer than that of the elephant: Four men at American Polymer—S. J. Baum, H. Naidus, A. N. Stull, and W. L. Abramowitz—worked for almost three years to bring their idea into tangible being. Their idea was to find a resin that could be used by the housewife, the industrial finisher, or the commercial laundry to simulate the action of starch.

A few problems had to be solved along the way: The resin had to be odorless and nontoxic. It had to be formulated to resist laundering and dry-cleaning solvents. Easy ironing required the incorporation of cross-linking agents in the polymer. And the final product had to be stable and easily applied so that it could be readily marketed.

Clothes Last Longer

Although the resin is costlier than starch, certain considerations weigh in its favor from the cost standpoint: The cloth does not lose its crispness after several launderings, and tests indicate that abrasion resistance and wearing qualities of treated cottons are improved more than 100%. To these are added some plus qualities: The surface of the fabric is less harsh than that of starched cloth, and resin-treated garments retain their freshness longer and soil less readily.

The resin is currently being sold only to manufacturers of textile finishes, but American Polymer officials are not unaware of the tremendous, untapped retail market: One of them says, "Right now I wish that we were merchandising experts instead of chemists."

NO FREE FLUORINE

A new process for fluorinating organic compounds uses low-voltage electrolysis, no free fluorine.

EVER SINCE the early 1900's, when organic fluorine compounds came out of the laboratory into the larger world beyond, preparation of these materials has been indirect and costly. Most processes depend on the substitution of chlorine with fluorine by the use of hydrogen fluoride, direct fluorination, or the employment of an intermediate fluorinating agent such as cobalt trifluoride or silver difluoride.

Now Minnesota Mining & Manufacturing Co., eyeing the potentialities of fluorine-containing organics, is developing in a pilot plant the electrolytic process invented by Pennsylvania State College's J. H. Simons. The 3M Co.'s development project is headed up by C. W. Walton.

A Black Box

Simon's process is carried out in "a black box, roughly the size of an ordinary office desk." In that iron box, which is actually an electrolytic cell with an iron cathode and a nickel anode, a 5- to 6-volt electric current is passed through a mixture of anhydrous hydrogen fluoride and the organic material to be fluorinated. (If the material is a hydrocarbon, a conducting material like water or sodium fluoride is added.)

The voltage isn't high enough to liberate fluorine at the anode; nevertheless, good yields of fluorocarbons are obtained. The principal product is the fluorocarbon with the same number of carbon atoms as the starting material, although shorter and longer carbon chains are also found in the product mixture. The voltage has to be kept low; for if it rises high enough to liberate fluorine, an explosion results and the organic molecules are shattered into small fragments.

Depending on the organic compound used, products can be prepared ranging from fluoroform and carbon tetrafluoride up to compounds boiling well above 100° C.

Hydrocarbons themselves can be fluorinated, as was mentioned, if a conducting material is added to the mixture. Carboxylic acids, alcohols, amines, ketones and ethers can also be fluorinated. With diethyl ether, for example, it is possible to prepare decafluorodiethyl ether. Alcohols and amines suffer from the disadvantage that polymeric substances are formed in the cell.

In operation the sheet-nickel anodes are suspended ¼" apart. The raw materials —liquefied by pressure and refrigeration —bathe the sheets; and the liberated hydrogen agitates the mixture and speeds the reaction. Products are drawn off as a gas or drained from the bottom of the cell, depending on their physical properties.

Better Engines, Fewer Fires

Fluorocarbons have a lot of desirable properties that can be put to use: they are heat-stable, chemically inert, and possess low toxicity, low surface tension, low solubility, and high density. They are already used widely, of course, as refrigerants and low-pressure propellants.

C. W. WALTON: From a black box, a rosy array.

Most frequently mentioned is their possible use in fire-retardant and fire-extinguishing compositions. Hydraulic fluids, for example, are a fire hazard—especially in airplanes. Fluorocarbon oils are a possible solution, for they are liquid over a wide range of temperatures and also possess lubricating qualities. Fluorine-containing plastics (CI, October, 1948, p. 586) and plasticizers, paints and textile finishes may find use in theaters and other public places where the lessened danger of fire would justify their higher cost.

The fluorocarbons' inertness at high temperatures and high vapor density are desirable properties for turbine impelling fluids. Even more interesting, a fluoro-

carbon's low heat of vaporization should make it an efficient fluid in a "steam" engine; since relatively little heat is required to vaporize the liquid, most of the heat energy would be recovered as work. Media for chemical reactions and heat-exchange fluids are two other applications for which fluorocarbons seem suited.

3M Expects a Payoff

Minnesota Mining is convinced that one or more of these possible applications will eventually develop into big business, and the company expects to supply the fluorocarbons at attractively low prices by virtue of its process.

That may all take time, but meanwhile the pilot plant is providing not only operating data on the process, but also samples of a great many products. These samples, the company believes, will point the way to future markets.

FETTERED IONS

Polyamino carboxylic acids are relatively expensive, but they excel in many ion-sequestering applications.

ION COMPLEXES are the bane of an analyst's life: he can add an oxalate to a calcium-ion complex, get no precipitate whatsoever, and conclude to his later embarrassment that his sample was calcium-free. By the same token, the complexes are a blessing to the dyer and the soapmaker, for they "lock up" offending metallic ions in such a way that they can't do any damage.

The most commonly used sequestering agents—as these materials are called—are the soluble polyphosphates. Without actually removing calcium and magnesium from boiler water, for example, they exert a softening effect by tying up the ions in a non-precipitable form. The polyphosphates are successfully used in a great many applications, but they are not completely stable in hot solutions.

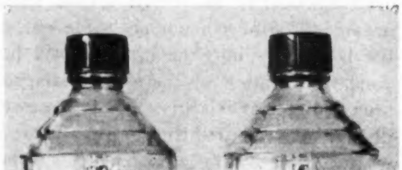
Imported from Europe

Now coming up as strong contenders with polyphosphates are a group of more expensive but more stable organic sequestering agents. These materials, polyamino carboxylic acids, were first developed in Germany. General Aniline & Film Corp. holds the original patents, and that company imported German-made materials for several years, now makes them in this country and sells them through General Dyestuff Corp. to the dye trade under the trade name "Nullapon." One of these materials is ethylene diamine tetra-acetic acid, $(HOOCCH_2)_2\ NCH_2CH_2N\ (CH_2COOH)_2$; another is nitrilo-triacetic acid, $N(CH_2COOH)_3$.

The process and product improvements made possible by these agents are not limited to dyeing; and now other companies, licensed by General Aniline, are producing polyamino carboxylic acids for general processing use. Riches-Nelson, Inc., is selling the aqueous solution of a salt as RN-Water Softener A, and Alrose Chemical Co. is marketing ethylene diamine tetra-acetic acid as Sequestrene AA and a 27% aqueous solution of the sodium salt as Sequestrene A.

Water-Soluble Ion Exchanger

Sequestrene A acts virtually like a water-soluble ion exchanger. The calcium and magnesium ions are "deionized" just as effectively as if they were



SEQUESTRENE IN SOAP (left): Complex conquers cloudiness.

removed by adsorption on a resin. One mol of the agent will bind a maximum of one gram ion of metal; and thus one part by weight of Sequestrene will bind 0.12 part of calcium. As the atomic weight increases with the heavier metals, the proportion will, of course, be more favorable.

Maximum binding is obtained at neutral or alkaline pH's. As the pH is lowered, stability of the complex decreases and the metal is progressively released in its ionized form. But unlike the metal-polyphosphate complexes, the metal-Sequestrene complexes may be boiled, or stored indefinitely in aqueous solution without breakdown. It is stable, actually, in 15% sodium hydroxide.

Other ions, besides calcium and magnesium, which are bound by Sequestrene are divalent barium, strontium, tin, copper, cadmium, cobalt, zinc, lead, manganese, nickel and the rare-earth metals. Complexes are also formed with such trivalent ions as iron, aluminum, and chromium.

A Little Metal, A Lot of Harm

The inhibition or catalysis of reactions and the deterioration of products by traces of metals is very probably more significant than is generally realized: A few parts per million of copper, for example, hastens the deterioration of rubber. Traces of manganese or cobalt catalyze the development of rancidity in soaps. Small amounts of calcium dissolved out of glass containers by soap shampoos yield unsightly precipitates. Micro quantities of metal salts inactivate enzymes, reduce reaction yields, promote darkening of foods and tendering of textiles.

Even though the materials are not cheap—one of them sells for $1.35 per lb.—they are used in trace quantities to counteract trace impurities, and for that reason the cost of use is not great. Alrose is counting on that fact, together with tangible process and product improvements, to put this extra ingredient in processing kettles.

CONTINUOUS GREASE

A new process makes lime-soap grease faster, cheaper.

ANOTHER ROMANTIC industrial art saw the last of its glamor fade a few weeks ago when a plant at Esso Standard Oil Co.'s Baltimore refinery began production of lime-soap grease by a continuous process. This plant is the outgrowth of a pilot plant which operated in 1941, but which had to be postponed for emergency projects. Although grease-making has come a long way from the day when the skilled artisan's senses were the control, it has remained a batch process dependent to a large extent on the individual overseeing each run. Now it takes its place alongside other industrial processes with batches giving way to continuous operation and guesswork losing out to automatic control.

Faster Cooker

Heart of Esso Standard's new process is a rapid soap cooker which reduces the three and a half-hour cycle to forty-five minutes. This consists of a heat exchanger and three tanks, each holding 2,000 pounds of soap mix. While the charge of one tank (lime and fat, for example) is being circulated through the heat exchanger to form the soap, another is being filled in readiness for cooking; and the third, which has just been cooked, is being discharged into the mixer for oiling.

The mixer is a system of loose gears making 3,600 revolutions per minute inside a compact metal housing. Soap enters at one side, and the mineral oil from the other. After blending, the finished product is forced continually out of a filling pipe. Although this method of oiling has little or no advantage in speed

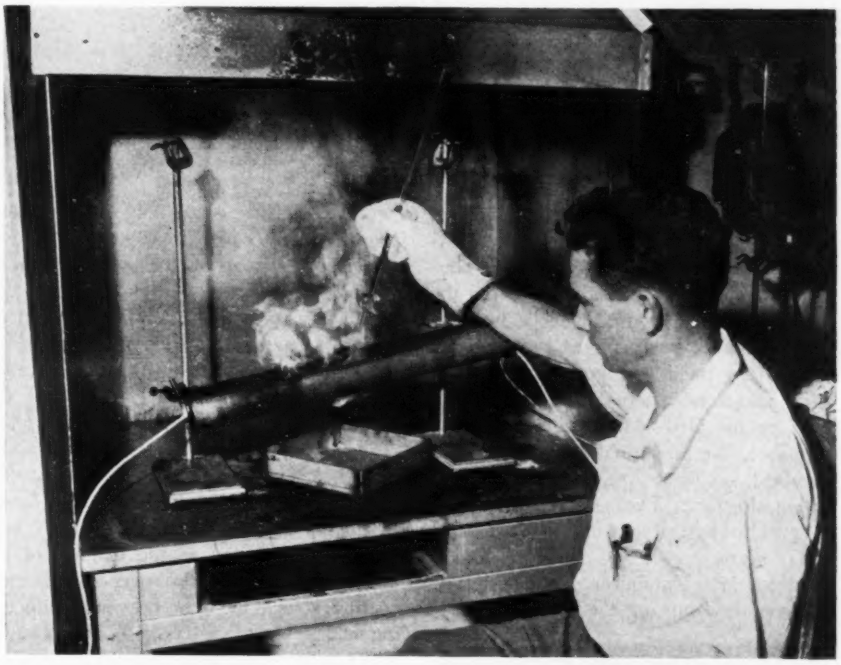
over that accomplished by paddles in a kettle, several mixers may be used to match the speed of the cooker. Moreover, since packaging does not have to wait for a kettle to be dumped, filling can take place as soon as the mixer begins to operate.

In addition to the shorter production cycle, the Esso process has the advantage of better blending of soap and oil. So efficient is the mixer, the proportion of soap to oil for a given grade of grease can be reduced to allow a saving of 10 per cent in the fat required.

Although it marks the end of an era, the sight of grease pouring out of the new plant's fill pipe at the rate of eighty pounds a minute should awaken any old-time greasemaker's memories. In the 1880's, he was regarded much as a continental winemaker or brewmaster. This position, which meant supervision of the kettles and access to the highly secret formulas for mixing soap and oil, was won only by years of apprenticeship. His practiced eye to follow the course of the reaction, and "grease fingers" to pass on the quality of the product were the control tests of those days.

In time, closed cookers replaced the open kettles, and formulas came from the laboratory instead of lore. Despite the introduction of modern production methods, an aura of the old days persisted as long as the kettles had to be charged and dumped for each run. But now that last vestige of the past has disappeared in the automatically controlled continuous cycle. If the operator smears his fingers with grease to test its body, he's only dirtying his hands unnecessarily. A pressure viscosimeter continuously takes a small sample, and any deviation from the desired consistency automatically shuts down the plant until the operator checks the valves and rights the trouble. The craft has become a job.

GREASEMAKER: Gages will take over.



NO FLAME, only smoke, when new phosphate ester hydraulic fluid is dripped on glowing red exhaust pipe.

FIREPROOF FLUID

New synthetic hydraulic fluid for airplanes combines fire resistance with top performance.

EVER since the series of disastrous fires in airplanes a couple of years ago, commercial airlines and aircraft manufacturers have been under pressure to find a suitable nonflammable fluid for use in the hydraulic systems of planes. One research team, comprised of representatives of Douglas Aircraft Co. and Monsanto Chemical Co., which has been working feverishly on the problem, announced the result of its efforts last month: a phosphate ester-base compound which provides hitherto unattained fire-resistant qualities without sacrifice in performance.

The new fluid, which is called Skydrol, undergoes self-ignition at 1050° F., as compared with about 500° F. for petroleum hydrocarbon hydraulic fluids. It has a viscosity index of 160, with little change in viscosity over a wide temperature range, and a lubricity which it is claimed will extend several-fold the life of the high-speed gear pumps and other moving parts in the hydraulic system. Douglas officials, in fact, expect the new fluid to have a life of at least 700 hours in a commercial transport plane as against 150 hours for the petroleum-base fluids.

Skydrol is also claimed to be noncorrosive. It does not contain halogenated hydrocarbons, salts, or water, and is said to be extremely resistant to aeration oxidation. The new fluid was operated in an aircraft hydraulic system test stand for the equivalent of more than 4000 flight hours under maximum pressure at a temperature of 160°F. The viscosity loss due to shear breakdown was less than 18%. Presently used fluids undergo 30% breakdown in about 2000 flight hours of operation.

Although operational checks are still being made on the material under actual flying conditions, it is currently being produced commercially by Monsanto and is expected to be generally available by the end of the year at a price of $1.33 per lb. in drum lots. About 17 gallons are required in a DC-6 airplane.

GREENER GRASS

"THE GRASS always looks greener on the other side of the fence," says an old proverb. And medical researchers, says E. H. Volwiler, executive vice president of Abbott Laboratories, are unconsciously guilty of subscribing to the truth of that old saying.

Pointing out that universities, government laboratories and industrial research centers are turning out thousands of new compounds in the hope of developing new leads or finding useful drugs, Dr. Volwiler said that a large proportion of this work is being done without the benefit of a good advance theory of relationship of chemical constitution to physiological action.

"We already have hundreds of thousands of organic compounds representing thousands of classes," he said, "and of these classes only a limited number have been pharmacologically investigated."

NO CEILING FOR XERO

A new reproduction process traces images in electrical charges, prints with dry powder instead of liquid ink.

LAST month in New York a man snapped a picture. The trip of the shutter started a clock, and while the photographer and his assistant processed the strange new plate, the audience watched the inexorable sweep of the second hand. Before the hand had gone around once —in 53 seconds, actually—the two men held up for view a finished print of the snapshot. No silver halide emulsion was involved, no diazo dye—no chemical reaction, in fact. The picture was taken by purely physical (as opposed to chemical) means.

Seated in the audience was Chester F. Carlson, inventor of the process. Carlson is a New York patent attorney, but more than that, he is a graduate physicist from Cal Tech and a basement tinkerer. Several years ago he started tinkering with a new principle of graphic arts reproduction, and his infant process looked so promising that he laid it on the doorstep of Battelle Memorial Institute, where it was nurtured with loving care.

CHESTER CARLSON: Up from the basement.

Battelle found in The Haloid Co., of Rochester, N. Y., manufacturers of photographic and photocopying equipment, an enthusiastic sponsor for the research and development of Carlson's invention. The Haloid Co. has acquired from Battelle the rights to use and license the process. The Army Signal Corps also has a hand in the research sponsorship.

Electrostatic Image

Key to xerography (from the Greek *xeros*, dry, and *graphe*, writing), as the process is called, is a group of chemicals that are photoconductive insulators, i.e., they are insulators in the dark, but they conduct electricity when light strikes them. Examples of such materials are sulfur, selenium, and anthracene.

A sheet of metal uniformly coated with a photoconductive insulating material is passed in the dark under a corona discharge, which leaves a static charge uniformly distributed over the insulating coating. Now when the plate is exposed in a camera, under a projection lens, or in a contact frame in the manner of a photographic plate, the portions of the coating struck by light become conducting and allow the charges to leak away, while the unexposed portions retain their charges. The plate thus has a latent electrostatic image upon it. Exposure time is equivalent to that required by fast silver halide projection papers.

Developed with Dust

Everyone has seen how dust particles adhere to an electrically charged glass or amber rod. The development of the xerographic plate works on the same principle. A two-component developing powder is flowed over the plate in the dark. One component is a relatively coarse carrier material—ammonium chloride and sodium chloride have been used; the other component is a very finely divided material such as gilsonite or a low-melting synthetic resin. Shaking these two dissimilar materials together charges the particles with electricity. When the powder flows over the plate, the fine particles are attracted to the charged portions of the plate, where they adhere tenaciously. The light-affected portions of the plate are unable to retain the powder and it rolls off. The result is a mirror-reversed positive image of the original subject or copy. This corresponds to the developed negative in silver-emulsion photography and takes only a few seconds to prepare.

Dust Behaves Like Ink

A permanent print is made by laying a sheet of ordinary paper over the powdered plate and charging the paper with the same corona discharge apparatus used to sensitize the plate. The powder forsakes the plate and jumps to the charged paper, and by this transfer the image is restored to its true left-right relationship. At this stage the print corresponds to a developed silver-emulsion print before it is fixed in sodium hyposulfite.

Fixing is accomplished by heating the paper for a second or two under infrared lamps, in an oven, or between heated platens. The powder particles melt and fuse to the paper. Since the material on which the final print is made is merely a surface to receive the powdered image, almost any type of paper — or cloth, metal, wood and ceramic surfaces —can be printed in this manner.

If the developing powder is black, the print, of course, will be black. Monotone color prints can be made directly by using developing powder that has been dyed the desired color. The process has not been designed for multicolor reproduction, but some experimental multicolor prints have been made by using separate plate images for each color.

As the process stands now, it reproduces line drawings well. Present results with continuous shading — "halftone" reproduction—are encouraging, but more work has to be done on that phase of the project.

Printing without Ink

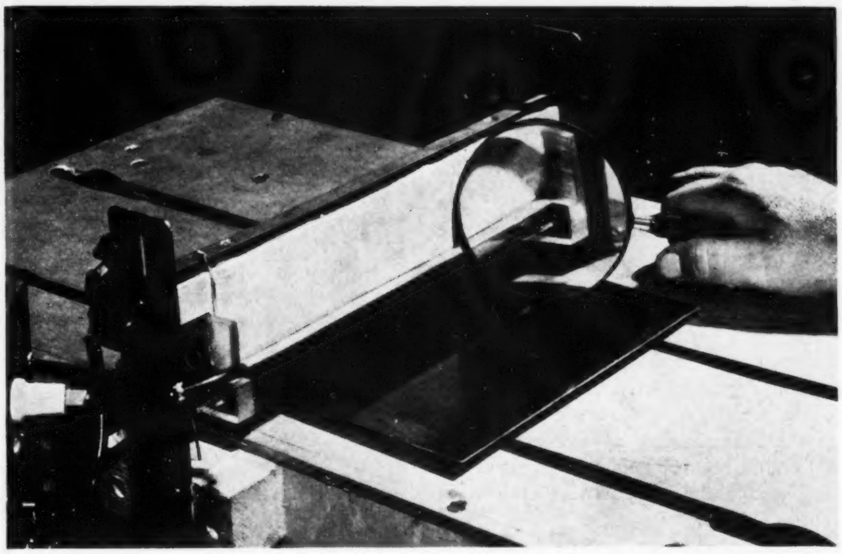
An outgrowth of the xerographic process is xeroprinting. If the powder image is not transferred to paper but fused directly on the metal plate, one then has an image of insulating material on a conducting background. Such a plate can also be made by conventional photomechanical processes.

The printing machine uses a rotating cylinder to which the xeroprinting plate is attached. When the machine is operating, the image plate passes under a corona discharge device, where an electrostatic charge is imparted evenly to the plate. The charge immediately leaks off from the conducting, non-printing portion but is retained by the insulating, printing surfaces. As the cylinder turns, the plate enters a developing chamber, where a xerographic powder is cascaded against it. The powder adheres, of course, to the charged portions of the plate.

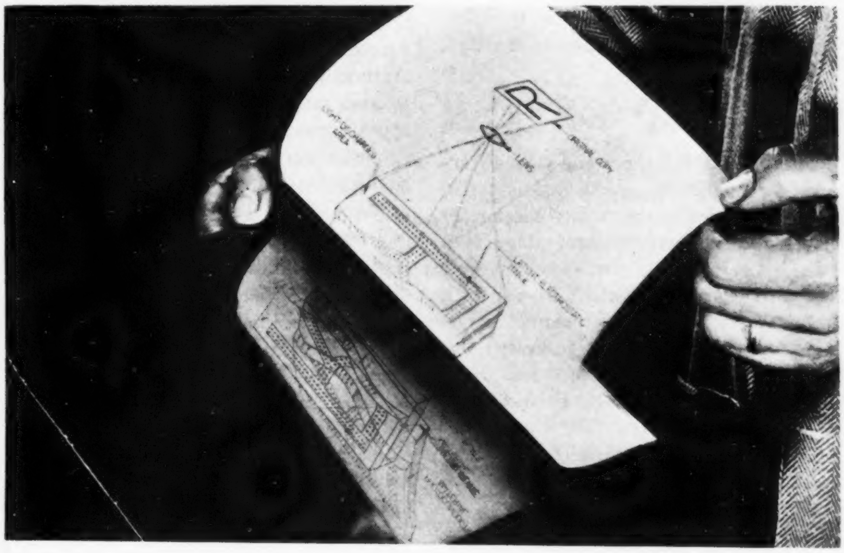
The developed plate then passes under paper, which is fed into the machine by standard paper-feed equipment. The paper and plate pass under corona discharge points, where the image is transferred to paper and the plate is simultaneously recharged for the next revolution of the cylinder. The paper, bearing the powder image, then passes through a heating unit, where the powder image is fixed by heat.

At the demonstration a simple laboratory-model printing machine turned out printed copy at the rate of 1,200 web feet a minute.

After running the laboratory-model xeroprinter, R. M. Schaffert of Battelle and Joseph C. Wilson of Haloid ventured



XEROGRAPHIC PLATE is passed under a corona discharge for sensitization.



FINISHED COPY is made from exposed and developed plate. After fixing by heat it will be finished.

OPERATOR fills receptacle of xeropress with "dry ink."

a guess as to what effect xeroprinting might have on commercial printing processes.

The huge size of modern presses, they said, is necessary because of the pressure that must be applied to transfer a tacky, viscous ink to paper. In xeroprinting no pressure is necessary: the powder is "jet-propelled" from the plate to the paper by an acquired electrical charge. For xeroprinting, lighter and cheaper presses could be used.

Economy Is the Payoff

When comes the revolution? Not next week, say Battelle and Haloid officials, for xerography and xeroprinting are still definitely in the development stage. But Haloid is now readying for the market a simple and compact xerocopying machine for reproducing letters, drawings, and other business documents.

The essential advantages of the principle—speed, low cost (the powder is cheap and the xeroplates can be used over and over) and simplicity—point to a busy future for xero-processes.

CAPERS IN CAUSTIC

Indian speculation distorts demand for caustic soda.

THE BRITISH decision to dissolve some of their Empire, the universal desire to make a dollar, and the American market for caustic soda appear to be only remotely related. A number of exporters know better. They besieged the U. S. Department of Commerce during the third quarter of the year for licenses to ship 50 to 60 times as much caustic to India as the government allows under the alkali export control program. Domestic consumers have good cause to be thankful that officials approved only the set amount of 14 million pounds. The rapidly brightening supply picture in this country was thus saved from possible serious disruption, and the headaches were confined largely to the Washington paper mill.

First in the chain of events causing development of this situation was the achievement of independent status by India. The British, with much less stake in that country's fortunes and desirous of bolstering areas more strategic in the new Empire picture, began shipping chemicals and other materials formerly supplied to India to other portions of the globe. Caustic soda, one of the major Indian imports, was needed for manufacture of soap and other products. Consumers, whose stocks were soon reduced, had to scurry about for new sources of supply. A vast army of speculators has sprung up over there to take advan-

tage of the shortages, and, incidentally, to flood this country with orders.

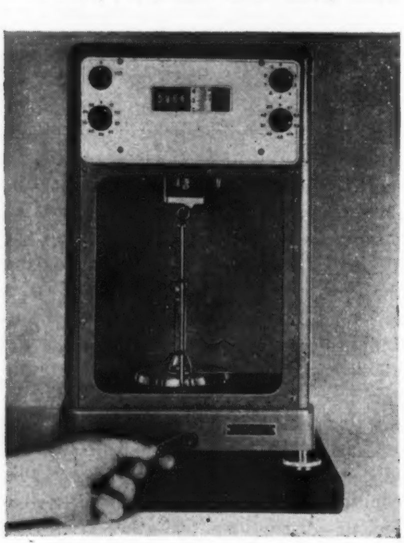
For the past five or six months orders for caustic have been pouring in to American exporters, who present them to the Department of Commerce with applications to ship the desired quantity. Some of the demand is undoubtedly real as legitimate consumers and suppliers seek new sources of caustic. Requests for a billion pounds for three months, however, reflect a speculative market that would have considerable effect here if allowed to operate freely.

ALWAYS TWO HUNDRED

A new one-pan, constant-load analytical balance speeds weighings, has constant sensitivity.

MOST "quant" students carry away one most unhappy memory: the maddening minutes they sat at the balance table, watching the pointer swing to and fro, to and fro; and just at the crucial moment the elusive little platinum rider always fell into the corner of the balance case.

Students probably won't benefit from the new $975 Gram-atic balance, intro-



GRAM-ATIC BALANCE: 12.3312 grams in 20.7 seconds.

duced by Fisher Scientific Co. and Eimer & Amend, unless their institutions are very heavily endowed. But industrial laboratories, where analyses cost money and time spent watching a swinging beam is profits down the drain, may find the expensive tool, for which a weighing time of 20.7 seconds is claimed, a profitable investment. Even if speeds of that order take some practice to achieve, still "weighings can be made with the Gram-atic balance in less than one-third of the time required by the usual analytical balance."

How is such speed achieved? For one thing, the last three decimal places (centigrams, milligrams, and tenth-milligrams) are read directly off an optical vernier scale. Deflection of the beam is measured by a scale attached to the beam and projected onto a ground-glass screen by an optical system. Grams (up to 199) and tenth-grams (up to 0.9) are lifted off the pan-end of the beam by knobs on the control panel. The total weight thus removed is indicated on dial counters. The opposite end of the beam is constantly loaded by a permanent weight to balance the pan and removable weights, and weight is removed from the pan-end equal to the weight of the sample. The load on the beam is thus always brought to 200 grams, regardless of the weight of the sample, and the sensitivity, therefore, is constant.

Analytical chemists flocked to Fisher's booth at the National Chemical Exposition in Chicago last month to see and try out the new balance, which is manufactured by the E. Mettler Co., in Switzerland.

Semi-Micro Coming

The present balance weighs to an accuracy of ± 0.00005 grams and is therefore suitable for ordinary analytical techniques. In the experimental stage is a balance operating on the same principle that will weigh accurately in the fifth decimal place—the semi-micro range. Micro balances (six-place accuracy) are still only in the idea department.

One feature puts the new balance right up in the Atomic era: All the weighings are controlled by turning knobs, and the knobs can be extended so that they can be operated from behind a lead or concrete barrier.

TITANIA ON TOP

Titanium-based frits have come to the fore to opacify porcelain enamels.

A CASUAL glance about the 1948 kitchen reveals that the old standby, porcelain enamel, is still very much in evidence in these days of the new look and new materials. Closer examination, however, would show that the gleaming white of range tops, refrigerator liners, utensil ware and cabinet and table tops is not what it used to be. The white is more opaque, and will endure much longer than previous enamels, for it is highly resistant to the acidic vapors and liquids of foods and cooking gas that are ever present in the kitchen.

This change in enamel composition marks a new stage in the industry's continuing search for an acid-resistant opaque finish. It is obvious that the cheapest

TITANIA: The range is broader.

and thinnest durable covering that will conceal iron or steel is the desired enamel. Antimony-based enamels were the first to give satisfaction in applications where appearance and acid resistance are of prime importance, but these were not sufficiently opaque. Zirconium products replaced these, but while these enamels had good opacity, a highly acid-resistant finish has never been commercially produced from zircon (zirconium silicate). The high refractive index of titania, so useful in paints, and its acid-resistant qualities in enamels have long marked it as a possible answer to the problem. Developments of the past few years have brought it to a point where it is now edging zirconium out of first spot.

In the Frit

Enamel finishes are prepared by coating specially treated iron or steel with an enamel "slip," drying this, and then firing it in a furnace. The slip is formed by milling frit, water and various "mill additives"—clay, opacifiers, pigments, and electrolytes—to produce a suspension that has the proper working characteristics and will bake to give a suitable finish. Porcelain enamel frits are complex glasses which are melted and poured into water. The small particles into which the glass shatters are called "frit." In most enamels, the frit does not itself lend enough opacity, so materials such as tin oxide, zirconium compounds, antimony compounds and titanium dioxide are added during milling. Clay has many functions, acting as a suspension agent, temperature regulator, and final binder along with controlling the physical structure and quality of the finish. Pigments are necessary where colored products are desired, and electrolytes are required to maintain proper suspension of the enamel.

Composition of the frit is very important to development of white color and opacity. While crystallization of zirconia frits from glassy solution by the heat treatment gave opacified finishes, they required further addition of opacifier in the mill. Titania frits do not call for any TiO_2 as a mill additive, although some manufacturers use 1 to 2 per cent. This is not to impart greater opacity to the finish; pigmenting the raw enamel helps the operator to judge the thickness of the coat he is applying. Selection of clays and addition salts is also vital, as these can be the key to a good white color.

This delicacy of formulation is understood now, but earlier, technical men often erred in using standard additives to give desired properties. When they put in something that "always worked before", they wound up with a dirty brown enamel. Today's whites come from balanced formulas.

Properties

Outstanding among the properties of titanium enamels is the development of peak opacity at low application weights. This permits lower operational costs and thinner coats. The latter has resulted in marked improvement in resistance to both thermal shock and flexure. On the debit side is a low coefficient of expansion which makes these enamels susceptible to spalling when applied in heavy coats. This is a particular problem on the rounded edges of pots and pans. One solution is to put on a first coat of zircon enamel, and then a thin coat of titania enamel to give the proper opacity and acid resistance. Zircon enamels give a bluish white, while titania is cream white, so some matching is necessary, but in general the desired shade is possible.

Scratch resistance of these enamels is good, and only where this is the prime requirement are they not selected. Impact resistance on flat surfaces is excellent, while that on a radius is poorer than some types. The combination of high mechanical strength and low density gives good results in the first case; thinner coats tend to lessen resistance in the latter.

Although their acid-resisting properties make these enamels the choice over zircons, they do not come up to antimony-based enamels in this respect. Antimony enamels are still number one for those jobs where acid resistance is the principal requirement and the clear finish they yield is no drawback.

More Demand for Titania

The superior performance of titanium enamels has enabled them to make inroads into the zircon business despite higher cost—one and a half times that of zircons. Because of the general expansion of the enamel industry, their effect has not been so obvious. Zircons, however, would have registered much greater gains if titania frits had not reached their advanced stature in the last couple of years.

Originally the outcropping of persistent colors, such as small amounts of chromium impart to the finish, was a big problem. The pigment people removed that difficulty by producing sufficiently pure material, but the expanded paint business and other older uses for titania have had first claim on supplies. This has handicapped the development somewhat, but when greater amounts are available, titania enamels will cut into zircons further. Direct application of these enamels to special steels, in which they far surpass zircon finishes, seems the most promising new field. Further developments of titania frits may make possible the all-acid-resistant white porcelain finish that is every enameler's dream.

McCARTHY OPERATES

Direct oxidation of methane and ethane with elemental oxygen is now underway.

PRODUCTION of formaldehyde, methanol and acetaldehyde is now under way at the new plant of the McCarthy Chemical Co. at Winnie, Texas. Here the C_1 and C_2 portions of natural gas are reacted with elemental oxygen (oxygen plant by Stacey-Dresser) for the production of these materials (CI, February 1948, p. 220).

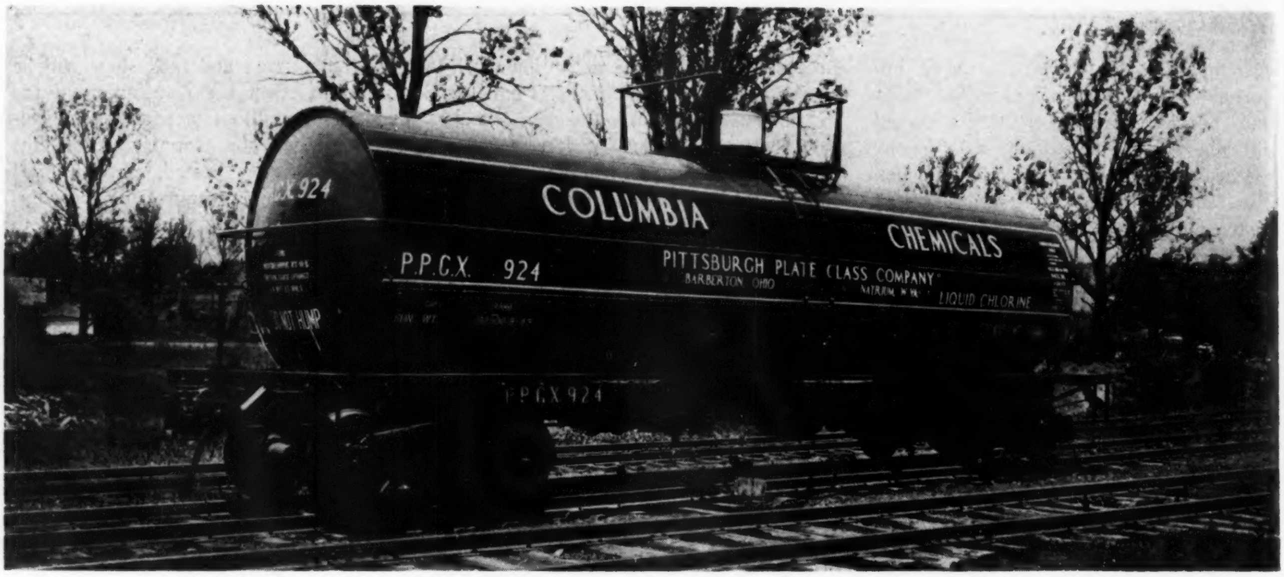
Both tank cars and tank ships will be utilized to effect the distribution of the hundreds of millions of pounds of chemicals that will be manufactured. One hundred and fifty heated, Heresite-lined tank cars will be required for the shipment of the formaldehyde which is to be supplied both as inhibited 37% solution and uninhibited 50% solution. The methanol will require at least forty steel tank cars while the acetaldehyde will need fifty of insulated steel. The plant is so designed that a wide variation in the quantities of each product is possible permitting a great deal of operational flexibility.

A products pipeline from Winnie to Port Neches allows deep-water loading of both McCarthy Chemical's products and the LPG hydrocarbons and gasoline now being produced by a McCarthy neighbor and affiliate, Absorption Plant, Inc. A new Cycloversion unit for the production of gasoline by the catalytic reforming of natural gas is now in operation and is expected eventually to provide the raw material feed stock for the preparation of aromatic hydrocarbons. This latter step is still only in the planning stage.

Ethylene

The ethylene plant noted previously (CI, p. 220, Feb., 1948) is, as yet, still on the drafting board. However, its construction is expected to follow in the near future. McCarthy plans to use a good deal of the ethylene in its own operations, marketing a very sizable percentage via pipeline to any one of several surrounding consumers.

McCARTHY'S DOCKS: By land and by sea.



Bulk shipment of chlorine is in 55 ton tank cars . . .

Shipping Equipment Matches Chemical Industry Pace

by FRANK G. MOORE* and J. E. WEAVER**
Columbia Chemical Division, Pittsburgh Plate Glass Co.

IMPROVEMENTS IN DESIGN and materials of construction have provided containers that make possible reduced shipping and handling costs for bulk shipment of a variety of chemicals. Safety, economy, and purity of product have guided developments.

IN EXAMINING conditions promoting the present high level of activity in the chemical industry, it is natural to pay most attention to chemical processes and products. The vital role of shipping containers is easily overlooked for their contribution is not so obvious. These materials, however, were not always available or suitable for all chemicals, and without the steady improvement that has brought them to their present state, transportation of chemicals would be a bottleneck in industry. That containers are taken for granted much as the outfielder who never has to run for a fly ball is a tribute to the efficiency achieved in their design and construction.

TANK CARS

Tank cars—one of the larger containers—were formerly very crude affairs. Very little metal was used in their construction and many of them could be described as nothing more than wooden tubs or vats mounted on wooden underframes. In 1907, the Bureau of Explosives commenced to give serious consideration to the safe transportation of dangerous chemicals. This led to the initial establishment of specifications for steel tank car tanks by the Association of American Railroads. Compliance with these specifications was then required of tank cars built after the effective date of the specifications before railroads could accept them for transportation.

In the beginning, the steel tanks were of riveted construction. In 1915, however, the Interstate Commerce Commission authorized fabrication of the first tank car tank by fusion welding. This car was for use in transporting vegetable oil. At about the same time a pressure tank with A.A.R. specifications calling for a forge-lap welding method was authorized. These cars were for the shipment of compressed gases including liquid chlorine upon which a limit of 15 tons was placed.

During World War I, there was constructed for the federal government (according to Bureau of Explosives specifications BE27) the tank known today as the one-ton chlorine tank. In 1920 these tanks were approved for transportation of chlorine, sulphur dioxide and methyl chloride—the beginning of what is now termed the multi-unit tank car. The first shipment of these tanks was made in gondola cars, but the cradle car holding 15 of these one-ton tanks was soon developed. The Interstate Commerce Commission then officially recognized the cradle, including the tanks, as a tank car and the containers became officially designated as tanks—not cylinders. (There is still some confusion today in referring to them as cylinders.) Restrictions then limited movement of these tanks except as part of a multi-unit tank car. The initial shipment of chlorine in this newly designated car in January, 1922, was the first step toward enabling bulk shipment of this chemical.

FUSION WELDING GAINS

Because of defects in construction, excess material requirements, and design stresses in riveted tanks, the Tank Car Committee of the Association of American Railroads petitioned the Interstate Commerce Commission in 1933 for general approval, for all commodities except chlorine, of pressure cars constructed by

* Traffic manager; ** assistant to the traffic manager, Pittsburgh, Pa.

. . . and more recently in 600 ton barges.

the fusion-welded method. The proposed tank specifications were almost identical with the then existing A.S.M.E. rules for Class I unfired pressure vessels. The petition was supported by the A.S.M.E. Boiler Code Committee, the American Petroleum Institute and other users, as well as by the manufacturers of welding equipment. The I.C.C. denied this petition because it was not convinced that the art of fusion welding had reached a degree of reliability or standardization that would justify its general acceptance for construction of car tanks for transporting dangerous chemicals. The I.C.C., however, recognizing the desirability of experience with fusion-welded tanks, authorized experimental cars for a few commodities where the tanks would be subjected to minimum internal pressures.

These I.C.C. authorizations for experimental purposes were the real beginning of major improvements in the construction of tank car tanks. Between 1933 and 1939, 525 experimental tanks were authorized for the transportation of liquefied petroleum gas, nitric and muriatic acids, anhydrous ammonia, metallic sodium, and butyraldehyde. Not all of these authorizations were taken advantage of, and those tanks that were built had joints constructed by various multi-pass methods of welding and practically all had riveted anchors.

The first car for shipment of metallic sodium, authorized in 1933, was the pressure type known as I.C.C. 105-A-300. Prior to this the material could not be shipped in tank cars. Longitudinal channels welded to the outside, and almost completely surrounding the tank are used in place of inside heating coils to liquefy the sodium for expeditious unloading. Oil is the heating medium, and four inches of cork provide insulation. The only change from original specifications is that fusion may replace forge welding.

In 1938, the Pittsburgh Plate Glass Co. made a specific application for thirty tank car tanks of fusion-welded construction to transport liquid caustic soda. These were the first tanks for which the single-pass machine method of welding the butt seams for longitudinal joints was proposed. The tanks were to be lined with a patented material and were to be much more heavily insulated than existing tanks. This better insulation and patented lining permitted delivery of a higher concentration caustic soda without the hazards of metal pick-up and without the necessity for steaming during unloading. The specifications on these cars also called for a 70-ton truck instead of the 50-ton trucks previously used.

OTHER IMPROVEMENTS

Various other improvements were called for in these cars. Among these were movable coils, permitting better access for lining and maintenance; insulation of the center anchorage to reduce heat losses; and the use of fibre glass in place of rock wool as an insulating material. There were also improvements in the bottom outlet valve and a change permitting its operation from outside the dome. The application was approved in 1939 and the cars were constructed and are still in service.

Following this, cars with fusion-welded tanks, some with fusion-welded anchors in place of riveted anchors, were approved for use in the transportation of ferric chloride and formic acid in addition to more cars for previously named chemicals. Later in 1940 the fusion-welded cars, having proved their worth, were removed from the experimental classification and became the permanent type construction for all commodities except chlorine. Efforts to secure approval of the new construction for chlorine were continued, and in 1941 the I.C.C. approved this car, including welded anchors, for chlorine service. The maximum weight permitted for chlorine, however, remained at 30 tons.

CHLORINE SHIPMENTS

For some time, because of the expanding consumption of chlorine, it had been felt that cars of greater capacity than 30 tons were necessary. There was considerable disagreement with this and little or no progress was made prior to the war. With the outbreak of war and the sudden increased chlorine demand, the W.P.B. proposed construction of a large number of cars with a capacity of 55 tons. The thought was expressed that they could be used for other commodities after the war emergency. Although the efforts of W.P.B., joined by those who had previously advocated larger cars, resulted in a temporary approval of cars of 55-ton capacity, the approval specified forge-welded type construction with riveted anchor. One hundred ten of the large cars were constructed.

Following the war, the larger cars were permanently approved and in 1946 were further improved by the I.C.C.'s' approval of fusion-welded construction. Since that time several hundred of the large type have been ordered.

During the past few years following the war, many notable improvements have been made in the design and construction of tank cars. Tanks have been built of aluminum for 95% nitric acid and for hydrogen peroxide of over 52% strength. Other tanks have been constructed of solid sheet nickel for benzyl chloride, phosphorus oxy- and trichloride; of lead-lined or nickel-lined steel for liquid bromine; and of special steels for dimethyl sulphate and hydrofluoric acid. Along with these tanks built of special

materials, there have been improvements in the design of heating coils, in tank linings and in insulation. A channel type heating coil (nothing more than a series of 6" x 2" channels inverted and welded to the bottom exterior of the tank) has been developed and has found application in both caustic soda and metallic sodium transportation.

Efforts to improve equipment further are continuing. Investigations of the possibilities of greater standardization of tank car fittings are under way, as is development of cars suitable for transportation of newer chemicals, as well as some old ones never before shipped in tanks. The aim of all design work has been to incorporate maximum safety with delivery of the purest chemicals at minimum cost.

Linde Air Products Co.

Hot-drawn cylinders weigh as much as 50 pounds less than the older forged type.

DRY MATERIALS

Along with developments in tank cars for shipment of liquids, progress has been made in the design and construction of cars for transportation of dry materials. Of late the covered hopper car is being more widely used by the chemical industry. These cars, originally built for the movement of bulk cement, have been improved so that there is little danger of losses in transit or product contamination. Consequently they are now carrying materials heretofore strictly packaged items.

A variation of the hopper car is the container car. This consists of from eight to twelve steel containers mounted on a flat bottom gondola car. The containers are constructed to allow easy removal from the car for loading and unloading. The advantages of this type car in batch operations, where the weight of material desired in a batch can be adjusted to the weight in a unit container, can be easily seen. The dry-flow car resembles a tank car and is used to ship dry materials requiring protection against moisture pick-up. This car is unloaded by a self-contained motor-driven endless chain conveyor.

Paralleling tank car tanks developments have been improvements in tank truck tanks. To provide for the safety of the motoring public, it has been necessary to meet strict specifications set by state and federal regulatory bodies. The major problems arising from these regulations have been solved and today sodium hypochlorite, caustic soda, tetraethyl lead, liquid carbon dioxide, anhydrous ammonia and various acids are transported by motor vehicles.

Cylinders as containers for compressed gases have been improved. Prior to 1941 cylinders were of the forged or pierced billet type, quite heavy and difficult to handle. In 1941, however, the Hackney type of hot drawn steel, with upper end closed by spinning, was developed and authorized for use. This new cylinder, weighing as much as 50 pounds less than the old, provides the advantages of easier handling and lower price, as well as considerable savings in freight charges. A cylinder manufactured by a cold drawn process is the latest improvement in this field. The better material necessary in this process permits thinner and more uniform walls than those produced by the hot-drawn method. In addition, since the inner walls are smoother, they are less subject to corrosion.

DRUM DEVELOPMENTS

Early types of drums used for shipping chemicals were of foreign manufacture employing three-piece construction with riveted chimes. When the Bureau of Explosives published specifications for drums, these drums were outlawed because of leaks around the rivets at side seams and chimes. The real beginning of drum manufacture in this country came when the I.C.C. took over the specifications and promulgated ones for the ICC-5A drum. This drum, as manufactured today, has a welded body seam, welded or double-seamed head and chime seams, flanges for closures welded in place, and rolling hoops. This is a returnable drum which, because of its construction, offers some difficulty in cleaning the interior. During the 1930's, the cold-drawn two-piece drum with welded circumferential body seam was developed, first without, and later with footings for protection of heads. Initial cost of this drum is higher but, because of easier cleaning and longer life, it is more economical.

Prior to 1938, the Consolidated Freight Classification Rule No. 40 (C.F.C. Rule No. 40) drum, widely used for non-dangerous chemicals, was constructed of 18 gauge steel throughout. In that year the M.C.A. succeeded in its efforts to reduce the body gauge of solid-head drums to 20 gauge. The new drum costs less than the previous type because it requires less steel and, because of this lower weight, slightly lower freight charges are paid on full drums. As these drums are single-trip containers and are sold along with their contents, much of the savings accrues to the consumer of the material shipped.

Drums have been constructed of stainless steel, nickel, aluminum and hard rubber for a variety of dangerous chemicals. Several years ago the M.C.A. completed a program to standardize the size and threading of plugs in returnable type drums. A program for the investigation of lining materials for single trip drums is now under way. This program, initiated by the chemical industry through its MCA committee on containers, is being carried on at the Battelle Memorial Institute, Columbus, Ohio, under the leadership of the Steel Shipping Container Institute. All of this work has been directed at reducing packaging costs without any reduction in the safety of the package and its contents, as well as preserving the quality of the goods while in transit.

With the development of the fibre drum came authorization for its use in shipping most non-dangerous dry chemicals and some of those classed as dangerous dry chemicals and some of those classed as dangerous. Upon specific application to the I.C.C. and a showing of adequate safety, it is possible to secure authorization to fill these drums to a

(*Turn to page 804*)

A **CI** REPORT ON

EMPLOYEE RELATIONS PRACTICES In The Chemical Industry

by ROBERT C. FORNEY*

THE CHEMICAL INDUSTRY HAS LONG PRIDED ITSELF on its progressive attitude and accomplishments in its relationships with employees. It has been some time, however, since a comprehensive survey of employee relations practices in the industry has been made. This report presents the results of such a survey that was made earlier this year among 121 chemical plants and three labor organizations active in the industry. It reflects the postwar changes that have taken place.

WORLD WAR II wrought changes in the conditions of work in the chemical industry as it did in every industry. With the return to peacetime production, some of these changes were happily eliminated, some justified their right to continued existence, and some were displaced by still later changes.

The purpose of this report is to present the picture of employee relations practices and conditions of work in the industry as they stand today. The data presented were obtained by questionnaire survey methods early this year and include information from 121 chemical plants and three labor organizations active in the industry.

Specifically the relationships between plant size, organization, and shift operation are outlined, and these factors are then related individually to industry-wide bargaining, hours of work, job analysis, the wage structure, employee benefits, settling of labor-management disputes, technological unemployment, and labor-management cooperation.

The chemical industry, as defined for the purposes of this report, parallels the Department of Labor classification and includes, in addition, manufacturers of coal distillation products. The industry as thus outlined included, at the beginning of this year, about 800,000 wage and salary earners, about three-fourths of whom were classed as production or maintenance workers.

The chemical plants included in the returns employ about 60,000 production and maintenance workers (10% of the industry's total), 7,000 persons classed as laboratory and technical personnel, 12,000 office workers, and 4,800 management personnel, a total of 83,800 wage and salary earners. Returns from the unions in the field include data on over 200,000 members, but many of these are probably in plants outside of the "chemical industry." The data presented here, unless otherwise stated, apply only to the factory employees or production workers of the industry.

When the surveyed plants are classified as to size, the small group (0-100 employees) accounts for 28% of the plants, but only 1.4% of the workers; the medium group (100-1000 employees) has 52% of the plants and 22.2% of the employees; the large group (over 1000 employees) has only 20% of the plants, but employs 76.4% of the total labor force. When classified as to organization, unionized plants are found to comprise 69% of the total plants and to employ 81% of the production workers, with unorganized plants making up the remainder. A unionized plant is defined as one which bargains collectively with District 50 (U. M. W.), the International Chemical Workers Union (A. F. of L.), the United Gas, Coke, and Chemical Workers of America (C. I. O.), another A. F. of L. or C. I. O. union, or an independent union, regardless of the number of workers represented by this union or unions.

The final classification of plants is by the number of shifts working each day, those working only one shift being classed as single-shift, and those working two or more shifts as multi-shift. A total of 75% of the plants fall in the multi-shift group, as this number are in at least partial multi-shift operation, 67% working three shifts, and 8% two shifts. The remaining 25%, of course, represents the single-shift plants. A complete breakdown of the plants as to size, organization, and shift operation, appears in Table I.

Table I and the preceding paragraphs indicate that a good majority of the chemical plants studied are organized and fall into the medium and large size groups. Such distribution does not hold exactly for the industry as a whole. These

* 1927 E. Calvert St., South Bend, Indiana.

two sampling deficiencies are recognized, and indicate that the greater value in interpreting the data is in the comparative values, rather than in the absolute values.

While the three factors of size, organization, and shift operation are treated separately in the comparisons, it must be remembered that certain relationships exist among these factors themselves, and that no one factor stands alone in determining the results found for it. For instance, it might be expected that multi-shift operation would be more a characteristic of the large and medium than of the small plants, and this is borne out in the survey, as over 90% of the large and medium plants are multi-shift as compared to only 32% of the small plants in such operation. The organized plants are also in the multi-shift class much more so than the unorganized, as almost 90% of the organized and only about 40% of the unorganized plants run two or three shifts.

TABLE I—CLASSIFICATION OF PLANTS SURVEYED

Type of Plant	*% of Total Plants*
Large, multi-shift, organized	18.2%
Large, multi-shift, unorganized	0.8%
Large, single-shift, organized	0.8%
Large, single-shift, unorganized	0.0%
Medium, multi-shift, organized	38.9%
Medium, multi-shift, unorganized	8.3%
Medium, single-shift, organized	2.5%
Medium, single-shift, unorganized	2.5%
Small, multi-shift, organized	5.0%
Small, multi-shift, unorganized	4.1%
Small, single-shift, organized	4.1%
Small, single-shift, unorganized	14.8%

There are also definate relationships which develop between plant size and organization, as over 90% of the large plants and almost 80% of the medium plants fall into the organized class, while only 32% of the small plants have unions present. Further evidence of the degree of union activity in various sizes of plants is shown in the fact that over 85% of the organized plants are in the large and medium size groups, while over 60% of the unorganized plants are in the small group.

INDIVIDUAL UNIONS

A consideration of the individual unions in the field, and of the two types of nonorganized plants, shows some differences in distribution when compared to the parent group (organized or unorganized), or to other sub-groups. These differences are summarized in Table II. Of the unions found in the chemical industry, District 50 of the U. M. W., the International Chemical Workers of the A. F. of L., and the United Gas, Coke, and Chemical Workers of the C. I. O. are the most active. District 50 claims to have several hundred locals in the chemical field, and is found in 15% of the surveyed plants representing 25% of the workers in the study. The I. C. W. U. claims 321 locals in the chemical field with a total membership of approximately 85,000. This union appears in 21% of the plants surveyed and represents 16% of the workers. The U. G. C. & C. W. claims a total membership of 60,000 in 250 locals, but is not too well represented in the surveyed plants, as it appears in only 6% of the plants, representing only 4% of the workers.

A. F. of L. unions other than the Chemical Workers, hereafter referred to as the A. F. of L. unions, are found in 13% of the surveyed plants. In most cases, however, these unions represent only certain groups within the plants, and often these locals have very few members. In many instances, two or more of these locals are found in the same plant, and in some other instances, they co-exist with an I.C.W. or a C.I.O. local.

C. I. O. unions other than the United Gas, Coke, & Chemical Workers, hereafter referred to as C. I. O. unions, are found in about the same percentage of plants (15%) as the A. F. of L. unions, but, because of their industrial type of organization, have a much higher percentage of their plants' workers in the locals. For this reason, and also because they tend strongly toward the large plants (see Table II), their membership far exceeds that of the A. F. of L. unions.

Independent unions, either local or national in scope, are but sparsely represented in the surveyed plants, covering but 7% of the plants and something under 3% of the workers. The national independents, such as the International Association of Machinists, usually have organized only certain groups within the plant, while the local independents are generally plant-wide in scope and have a much higher percentage of the workers.

TECHNICAL PERSONNEL

Brief mention will be made here of the extent of the unionization of laboratory and technical personnel. The survey shows that 8% of the plants have some degree of organizations of these employees, but, in most instances, this is merely an extension of the main plant organization to include the eligible employees in these classes. In less than 3% of the plants is there any separate organization of these groups, and even these give indication that the members are on a sub-professional level. Organization of this group of workers is thus definitely in its infancy, but it may be expected that unions will devote more and more time in the future to activity in this field.

Plants in which collective bargaining is carried on by a labor-management committee or another employee-management group are classed as unorganized in this discussion due to the lack of an "outside" labor organization. These groups are found in 6% of the plants covering less than 1% of the workers. While many persons would object to the term "collective bargaining" when applied to the activities of these groups, and the similarity of many of them to "company unions" makes their legality doubtful, there is some evidence to indicate an increase in the number of these organizations in the smaller, unorganized plants.

INDUSTRY WIDE BARGAINING

While this topic deserves mention in any discussion of industrial relations, it is not an important issue in the chemical industry at the present time. There are two main reasons for this. First, the diversity of products manufactured almost precludes the possibility of contracts covering the entire industry, and indicates that the most that could be expected would be contracts covering individual segments of the industry, such as artificial fibers, soaps, coal products, etc. Secondly, industry-wide bargaining has as a prerequi-

TABLE II—DISTRIBUTION OF ORGANIZED AND UNORGANIZED PLANTS

	Small	*Medium*	*Large*	*Single-Shift*	*Multi-Shift*
All Organized Plants	13%	60%	27%	11%	89%
District 50	22%	45%	33%	17%	83%
International Chemical Workers Union	8%	72%	20%	8%	92%
United Gas, Coke and Chemical Workers	....	86%	14%	29%	71%
Other A. F. of L. Unions	12%	56%	32%	12%	88%
Other C. I. O. Unions	17%	33%	50%	6%	94%
Independent Unions	....	75%	25%	12%	88%
All Unorganized Plants	62%	35%	3%	57%	43%
Employee-Management Groups	43%	57%	....	43%	57%
No Collective Bargaining	67%	30%	3%	60%	40%

TABLE III—HOURS OF WORK IN VARIOUS TYPES OF PLANTS

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Forty-hour work week	81%	62%	86%	96%	77%	82%	90%	59%
Operation per week:								
7 days	49%	15%	57%	75%	....	65%	56%	32%
6 days	12%	15%	13%	4%	10%	12%	14%	6%
5 or 5½ days	39%	70%	30%	21%	90%	23%	30%	62%
Multi-shift plants with:								
Rotating shifts	56%	27%	53%	78%	....	56%	61%	31%
Fixed shifts	28%	73%	24%	13%	....	28%	24%	44%
Both fixed and rotating shifts	16%	....	23%	9%	....	16%	15%	25%

site a high degree of organization on both sides of the bargaining table. As shown before, organization of labor in the industry is not complete at the present time, though there are probably some sections of the industry where labor is sufficiently organized to permit bargaining on a broad front. Employer organizations equipped to undertake collective bargaining are practically non-existent in the industry, although there are trade associations set up for the entire industry, and others set up for some parts of it. These organizations lack in numbers and strength the ability to carry on such negotiations even if they wanted to, which, by and large, they do not.

Union attitudes on the industry-wide bargaining problem are mixed. Chemical division literature of District 50, in 1944, mentioned annual national contracts as an objective of the U. M. W. in its organization of the chemical workers, but there is no evidence to indicate that this union has made any progress along these lines as yet. The International Chemical Workers Union goes half-way and says that it believes in industry-wide bargaining in some, but not all, branches of the industry. It further claims to have partially established this type of bargaining in the soap industry. The C. I. O. Gas, Coke, and Chemical Workers is on record as opposed to industry-wide bargaining for the chemical industry.

HOURS OF WORK

The setting of the hours during which employees shall work was one of the earliest topics for bargaining between management and labor, and an evaluation of industrial relations in the chemical field properly should include some data on how long employees work each week. While the war years and post-war expansion programs have tended, in a few cases, to bring on long work weeks which have been retained up to the present, the survey shows that only 19% of the plants now ordinarily have employees working longer than a 40-hour week. None have standard work weeks of less than 40 hours. Those plants working more than forty hours range from 42 to 52 hours in the work week, the most common figure being 48 hours. A comparison of work weeks in the various types of plants appears in Table III. It is interesting to note the difference between organized and unorganized plants on this score as it seems to indicate that organization is a powerful factor in retaining the work week at 40 hours.

The breakdown on hours of plant operation per day follows closely, but not exactly, the data on shift operation. A

Eighty-six per cent of the plants surveyed pay some differential for afternoon, night and rotating shifts. Refreshment facilities like these also help the monotony of the owl shift.

total of 63% of the establishments operate at least part of their plant 24 hours a day. An additional 12% are in 16-hour, or in a few cases, 18-hour operation. The remainder are, of course, the single-shift plants, which have mostly eight-hour operations. The few exceptions where 9-, 9½-, or 10-hour operations are the rule are practically all in small unorganized plants.

The continuous nature of chemical operations that makes it desirable or necessary to operate a plant twenty-four hours a day, also frequently makes it necessary to operate the plant seven days a week. This is borne out by the figures on "Operation Per Week" in Table III. Among the individual unions on this count, the District 50 plants and the United Gas, Coke, and Chemical Workers plants have over two-thirds of their plants in this 7-day group, while the International Chemical Workers Union plants and the independent union plants fall somewhat below the organized average here.

In multi-shift plants, the problem of whether to retain men on a given shift or to rotate shifts periodically has been and continues to be an important problem in industrial relations. According to Table III, rotation now holds a 2:1 advantage over non-rotation in the surveyed plants, and is especially favored by the larger and organized plants. The District 50 and U. G. C. & C. W. plants are strong for rotation, while the A. F. of L. plants and independent union plants are considerably below the organized plant average here. The A. F. of L. plants are strong for non-rotation (58%), and the I. C. W. U. plants and independent union plants are above organized average for plants having both fixed and rotating shifts.

JOB ANALYSIS

This is one of the newest phases of so-called "scientific management," but it has assumed a very important role in the industrial relations picture in the last decade. The exact description of the requirements of each job and the proper placing of each job in the plant structure has been the object of much recent effort in plants of all sizes and description, and the accomplishment of this end would seem to be an important step toward industrial peace.

The first step in a job analysis program is to set up a system of job descriptions, wherein the exact duties required of each job in the plant are stated. Ac-

TABLE IV—USE OF JOB ANALYSIS IN SURVEYED PLANTS

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Have job descriptions	55%	29%	72%	46%	37%	60%	62%	38%
Plants with job descriptions using them for:								
Job classification	73%	50%	73%	91%	64%	75%	67%	93%
Recruiting	65%	40%	69%	73%	73%	64%	64%	71%
Selection	59%	50%	56%	82%	82%	55%	56%	71%
Placement	70%	40%	73%	82%	73%	69%	66%	86%
Setting standards	50%	50%	47%	64%	64%	47%	44%	71%
Promotions	71%	50%	73%	82%	55%	75%	71%	71%
Training	58%	40%	58%	73%	45%	60%	59%	50%
Transfers	68%	20%	73%	91%	36%	75%	71%	57%
Plants with job classifications, using them for the wage structure	83%	100%	82%	70%	100%	80%	80%	92%

TABLE V—WEIGHTING OF FACTORS IN JOB CLASSIFICATION

	Average	*Range*
Skill	44.3%	0–90%
Effort	22.8%	5–60%
Responsibility	16.3%	0–25%
Working conditions	13.1%	0–33%
Others	3.5%	0–30%

TABLE VI—JOB CLASSIFICATION IN ORGANIZED AND UNORGANIZED PLANTS

	Org. Plants	*Unorg. Plants*
Skill	43.5%	50.2%
Effort	19.0%	24.5%
Responsibility	19.3%	10.6%
Working conditions	12.4%	13.0%
Other factors	5.8%	1.7%

cording to Table IV, medium-sized, multi-shift, and organized plants use descriptions more than the other groups. The low figure for large plants may be partially explained by the low figures for some individual unions. The District 50 and the C. I. O. plants, which together make up a large proportion of the large plants, are, with 50% and 28%, respectively, considerably below the average for all organized plants. Whether or not this trend represents a definite attitude on the part of these unions, or on the part of the operators of the large plants, remains a matter for conjecture. Among the unorganized plants, those with employee-management groups show a considerably higher percentage (57%) using job descriptions than do those plants with no collective bargaining at all (33%).

The biggest use of job descriptions is in the process usually known as job classification, in which the human qualities necessary for the performance of each job are determined, and the jobs in the plant are placed in their relative positions. In Table IV, it is seen that almost three-quarters of the plants with job descriptions use them as a first step toward a system of job classification, and that this use is especially characteristic of the large and the unorganized plants. Thus while the large and unorganized groups appear less apt to begin a program of job analysis, a higher percentage of those that begin extend their plans to include job classification. This trend continues to some extent in figures on the other uses of job descriptions. Among the individual unions, the United Gas, Coke, and Chemical Workers plants are considerably above the organized plant average in using job classification, while the A. F. of L. plants are somewhat below the organized average.

Job classification plans may be broken down to show the weights given in the various plans to skill, effort, responsibility, working conditions, and other factors, which include any items, such as base points, not easily classified in one of the other four factors. Table V gives an arithmetic mean of the weighting of the various factors in all the plans presented. On a size breakdown the plants differ but little on the weight attached to skill, but this is where the similarity ends. Small plants attach a weight of almost 40% to the effort factor, while in the medium and large plants it rates only about half that emphasis. Responsibility in the small plants is worth only about 5%, as compared to 17% in the medium and 21% in the large plants. Working conditions also get but 5% in the small plants, while they are given 16% in the medium plants and 11% in the large plants.

A pattern somewhat similar to that in the size comparison is found in the comparison between single- and multi-shift plants. Multi-shift plants attach somewhat more weight to skill (47% to 36%), and responsibility (19% to 8%), but attach much less weight to effort (17% to 39%) as compared to the single-shift plants.

As between organized and unorganized plants, there is surprisingly little difference in the weighting of the factors; while the unorganized attach a little more weight to skill and effort, and somewhat less to responsibility, the net effect is one of fairly close paralleling in the two groups. A complete breakdown of the two appears in Table VI. There are, in addition, no substantial differences among the individual unions in the weighting of plans in the plants where they are represented.

One of the main purposes of job classification is the establishment of the wage structure in the plant, and Table IV shows 83% of the surveyed plants with job classifications using them for this purpose. It is interesting to note the higher percentages for the small, single-shift, and unorganized groups here. Among the individual unions the U. G. C. & C. W., C. I. O., and independent union plants show much higher percentages than the others.

Whether or not job descriptions are extended to determine job requirements and make a job classification, they are frequently used as aids in other industrial relations activities, such as recruiting and selection of employees, setting job standards, etc. (see Table IV). It is interesting to note that the larger plants find all of these uses more applicable than do the smaller plants, while there is considerable variation in emphasis shown in the organization and shift comparisons.

SPECIAL FACTORS IN THE WAGE STRUCTURE

Studies and surveys are constantly made to determine the amount of wages paid to workers in various industries, and the chemical industry probably comes under surveillance as often as any other. For this reason, the actual amount of wages paid to workers has been omitted entirely here, and emphasis is placed instead on the extent and type of incentive payments, payments for hazardous occupations, and compensation for Sunday and holiday work.

It might be expected at the outset that the chemical industry would have fewer workers on an incentive basis than other manufacturing industries, due to the high percentage of machine or process-controlled operations and the high percentage of maintenance workers in the industry. This is borne out in the survey, for while almost one-quarter of the plants have some workers on an individual incentive plan, and about half that number have some employees on a group incentive (Table VII), the total number of workers on such plans is only 13%. Among the individual unions, District 50, the International Chemical Workers Union, and the United Gas, Coke and Chemical Workers are substantially below the organized plant average, while the independent union plants and C. I. O. plants are well above the average. Among the unorganized plants, those with employee-management groups utilize incentives much more than those with no collective bargaining at all.

Plants were questioned as to their use of indirect incentives and a total of 23% reported their use in various forms (see Table VII). In the category "other forms" were mentioned such things as Christmas bonuses, cost of living bonuses, retirement plans, suggestion systems, etc., all set up on an incentive basis.

TABLE VII—INCENTIVE AND PREMIUM PAYMENTS

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Have some workers on:								
Individual incentive	24%	18%	16%	54%	17%	26%	22%	30%
Group incentive	12%	....	6%	42%	....	15%	15%	3%
Use as indirect incentives:								
Profit sharing	6%							
Stock bonus	<1%							
Cash production bonus	6%							
Other forms	10%							
Offer extra compensation for hazardous occupations if plant does not use job classifications for wage structure	21%	11%	25%	29%	13%	24%	22%	20%
Pay shift differentials in plants with:								
Rotating shifts	89%	100%	84%	100%	....	89%	95%	55%
Fixed shifts	83%	38%	93%	100%	....	83%	97%	45%
Pay differential for Sundays in 7-day plants	41%	40%	44%	33%	....	41%	43%	42%
Pay differential for holidays	79%	47%	91%	92%	53%	87%	93%	46%

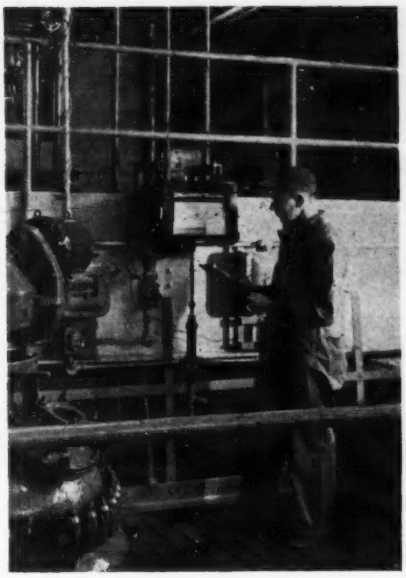
Table VII shows that, of those plants which do not use job classification to evolve their wage structure, about one-fifth offer additional compensation for their more hazardous occupations. The survey took no account, however, of what plants have occupations which might be considered "hazardous", and this figure might be misleadingly low for that reason.

Of those surveyed plants in multi-shift operation, a total of 86% pay some differential for afternoon, night, and/or rotating shifts. Of the 89% which pay a differential for rotating shifts, only 11% pay a differential to the men regardless of the shift they are working at the time; the remaining 78% pay only when the men are actually on the afternoon or night shift. Even these 11% indicated a second differential when the men are actually working afternoons or nights. Differentials, similar for fixed and rotating shifts, range from $0.03 to $0.14 per hour for the afternoon shifts, with $0.05 the most common, and from $0.05 to $0.22 for the night shifts, with $0.10 the most common. Several plants pay equal differentials for afternoon and evening work. Fourteen per cent of the multi-shift plants pay their differential on a percentage rather than a fixed sum basis, with 5% and 10% for afternoons and nights, respectively, the most common figures. A few plants indicated special methods of calculating differentials, but they are in reality only modifications of the above plans. In the comparisons (Table VII) it is interesting to note the effect of plant size where shifts are fixed, and the effect of organization in both types of shift arrangement. There are no substantial differences in the amounts paid in any case, however.

Table VII indicates that where Sunday work is scheduled as a part of ordinary shift operation, less than a majority of the 7-day-a-week plants offer extra compensation for this work. In addition to these plants, 74% of the 5-, 5½-, and 6-day-a-week plants indicated the differential they would pay for Sunday work if they found it necessary. In both instances, time and one-half and double time appear as the only common premiums, with the former in almost 40% and the latter in almost 60% of the plants. This distribution holds very closely in the size, organization, and shift comparisons. Within the organized group, however, District 50 and the C. I. O. unions have higher percentages in the double time group, and the International Chemical Workers Union locals have a somewhat lower percentage in this group.

TABLE VIII—HOLIDAY PREMIUMS

Premium Paid	*Size of Plant* Small	Medium	Large
1½ time	44%	32%	14%
Double time	56%	56%	72%
2½ or triple time	0%	12%	14%



Job analysis has been the objective of much recent effort in plants of all sizes and types.

While a total of 79% of the plants indicated a differential for holiday work, several plants said that such work was avoided, and it is thus somewhat difficult to tell just how many of the plants would pay some differential when holiday work was necessary. The size, organization, and shift comparisons all provide differences in this case (Table VII). While these differences can be partially explained on the basis of different percentages of the plants actually working on holidays, this probably will by no means account for all of the discrepancies. Of the plants indicating premium payments, 30% indicated 1½ time, 60% indicated double time, and 10% showed "penalty" payments of 2½ or triple time. Little difference exists here between single- and multi-shift plants, or organized and unorganized plants, but a considerable difference exists according to the size of the plant, as shown in Table VIII.

EMPLOYEE BENEFITS

These benefits or employee services, as used by most progressive employers today, are a part of the compensation of workers, and, generally, are expected to improve the efficiency of the working force. Gone is the taint of "paternalism" which formerly characterized many such benefits, and they have thus become one of the most important phases of industrial relations activity.

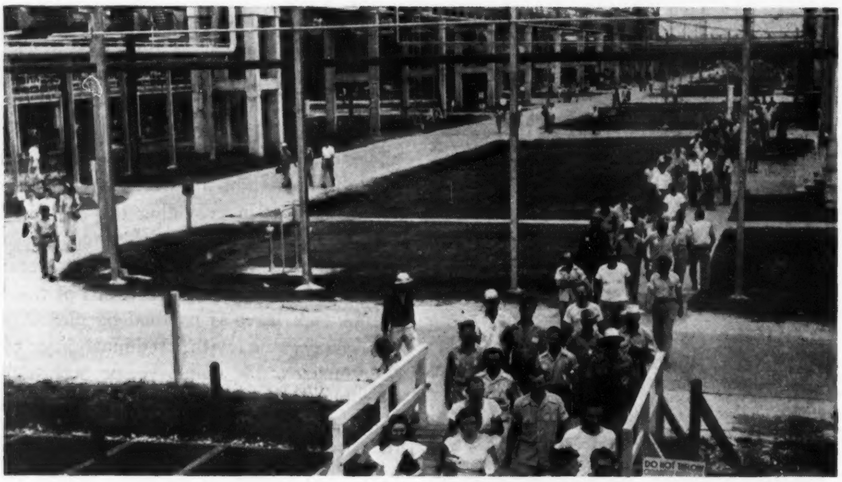
Paid sick leave for employees is one of the most common of these benefits, and the chemical industry has been a leader for some time in providing this for plant workers. The survey shows such plans in effect in about one-half of the plants (Table IX). In about one-third of these plants, sick leave is handled by means of insurance plans, with premiums paid by the company, the employee, or both, and usually offering a maximum of 13 weeks compensation. A common provision in these plans and in other plans makes the maximum length of benefits depend on seniority. Maxima of 7, 10, 20, and 30 days are all common, and in a few plants, the maximum number of days runs over 100. Some of the plans mentioned are so complex because of seniority provisions that it can only be said that the maximum number of days "varies." In a size comparison, the average maxima for medium and large plants are 55 and 83 days, respectively, as compared to only 15 days in the small plants. The difference is largely due, however, to the small plants' lack of insurance program plans with their long benefit periods. For the same reason, the multi-shift plants, with 65 days, are far above the single-shift, with 16 days.

While the unorganized plants show a slightly greater percentage with paid sick leave plans (Table IX), the data on average maxima reverse these figures, as they are 62 days for the organized and only 49 days for the unorganized plants. Among the individual unions, the District 50 plants have a much lower percentage, 22%, and a much lower average, 13 days, and the United Gas, Coke and Chemical Workers' plants have a higher percentage, 71%, but a much lower average, 12 days, in comparison with other organized plants. Again, this seems largely due to the lack of the insurance program type of benefit in these plants.

The chemical industry has also long been a leader in providing paid vacations for its employees, and the survey shows that almost all of the plants have this benefit at present. Maxima in working

TABLE IX—BENEFITS FOR FACTORY EMPLOYEES

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Paid sick leave	49%	47%	43%	67%	50%	48%	45%	57%
Paid vacations	98%	94%	99%	100%	93%	99%	98%	97%
Employees can work vacations for extra pay	26%	32%	22%	25%	37%	22%	21%	35%
Discount on company products	32%	32%	29%	42%	33%	32%	30%	38%
Cooperative buying of other products	7%							
Credit union	24%	3%	18%	71%	....	32%	31%	8%
Other loan fund	12%	24%	10%	....	17%	10%	6%	30%
Schools for special training	24%	6%	21%	58%	10%	29%	27%	16%
Group or individual ins.	84%	62%	89%	100%	60%	91%	89%	70%
Recreation program	52%	12%	57%	96%	10%	66%	65%	22%
Lunchroom or cafeteria	34%	6%	30%	83%	17%	39%	42%	16%
Physical examination at employment	69%	27%	79%	100%	27%	80%	82%	38%
Physical after employment	47%	21%	52%	71%	10%	59%	56%	27%



Shift change at Du Pont's Sabine Works, Orange, Texas.

days vary from 5 to 20, and as in the case of sick leave, seniority frequently determines length of vacation, especially in plants where the maxima is more than 10 working days. A total of 72% of the plants with paid vacations have maxima of two weeks, 18% have over two weeks, and the remaining 10%, less than two weeks. While all the size groups have about the same percentage of plants with two week maxima, only 7% of the small plants have over two weeks as compared to over 20% for the large and medium plants; these percentages are approximately reversed for plants having something less than two weeks as a maximum. This same trend appears in the other comparisons. The single- and multi-shift plants have about the same percentage with two week maxima, but the multi-shift have 21% over two weeks as compared to 7% for the single-shift, and the figures are again approximately reversed for those under two weeks. The organized plants fall in with the large, medium, and multi-shift groups, while the unorganized parallel the figures for the small and single-shift groups. Among the individual unions, the A. F. of L. plants and independent union plants show higher percentages with maxima over two weeks (47% and 38%, respectively) and the C. I. O. unions are almost completely in the two week group (94%).

Some plants permit their employees to work during their vacation period for the extra pay if they desire to do so, and about one-quarter of the plants here indicated use this policy (Table IX). Several plants in addition to these indicated that employees would be expected to do this if the company requested it, but that workers were not ordinarily given the choice. These plants are not included in this comparison.

While only about one-third of the plants offer their employees a discount on company products, obviously many who do not are manufacturers of products for which their employees would have no direct use. One manufacturer of unidentified products said he would give his employees all they wanted free of charge. The small number of plants which indicated sponsorship of co-operative buying projects indicates that such plans, not at all uncommon during the 20's and 30's, are today nearing extinction.

In the comparison on credit unions, it might be noted that International Chemical Workers Union and independent union plants are far below the organized average, while the United Gas, Coke and Chemical Workers and other C. I. O. unions are well above the organized plant average. In the comparison on schools for special training, the District 50, I.C.W.U. and A. F. of L. plants have percentages even below that for unorganized plants, while the U. G. C. of C.W. plants, C. I. O. plants and independent union plants have such schools in over half of their establishments surveyed.

The high figures for the group or individual insurance indicate that this is a popular type of benefit today. In well over three-quarters of these plans in the chemical plants, the company pays all or a part of the insurance premiums. There are no substantial differences among the individual unions in application.

In the comparison on recreation programs, the District 50 and A. F. of L. plants are somewhat below the organized average, while all of the other unions are over 65%. In the comparison on lunchrooms and cafeterias, the I.C.W.U., and again, District 50, are low (28% and 22% respectively), while the other unions have this benefit in over half of their plants.

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While there are no great differences among the individual unions' plants when considering physical examinations at time of employment, the A. F. of L. and independent union plants (both with 25%) are far below the organized average for physical examinations after employment.

GRIEVANCE PROCEDURES

This element in industrial relations represents the day-to-day, down-to-earth part of the structure. The manner in which these disputes or disagreements between members of the working force and management are disposed of in a large measure pre-determines the success of the whole industrial relations program. Examined here are the methods by which and the people by whom these disputes are handled in the chemical plants.

Considering only the organized plants for the moment, a well-defined grievance procedure is usually considered an essential of any collective bargaining contract, and the surveyed chemical plants show virtual unanimity in these procedures (Table X). The grievance procedures usually vary, however, in their form and in the directions in which appeals may be made. Both the grievance procedure and other parts of the contract may contain provisions for conciliation or mediation beyond that required by law, for arbitration of some disputes, or even for compulsory arbitration in some cases. Table X shows how the use of these various means of settling disputes varies in different types of plants. There are no substantial differences among individual unions in the degree of application of any of these methods.

Leaving union handling of grievances and turning to the plant line of authority, almost 85% of the plants stipulated that employees could carry their grievances above their immediate superior in the plant (Table X). The only surprising thing about this figure is that the remaining plants put such remarkable faith in the decisions of their foremen or first-line supervision. The comparisons between various types of plants show some differences here, but not as much as the comparisons on the sources of appeal. The breakdowns on the use of personnel departments and labor-management committees for this purpose probably give a good indication of the presence of these departments or groups in the various types of plants, although it is quite probable that some additional departments or groups are present and are not for some reason utilized in handling grievances. Among the "other sources" specified were company officers or top management (largely in the smaller plants), intermediate supervisory levels, industrial relations director (separated from the personnel department in plant organization), the plant owner, etc.

Among the individual unions, the District 50 and United Gas, Coke, and Chemical Workers are low in use of the personnel department (39% and 43%, respectively), while the International Chemical Workers Union and C. I. O. plants are considerably above the organized plant average here. In using labor-management committees, the U. G. C. & C. W. plants are again low (14%), while the I. C. W. U. (50%) and A. F. of L. plants (46%) show a high percentage of utilization of these groups.

TABLE X—EMPLOYEE GRIEVANCE METHODS IN SURVEYED PLANTS

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
In Organized Plants:								
Grievance procedure	98%	91%	98%	100%	89%	99%	98%	....
Conciliation or mediation	60%	73%	70%	30%	45%	61%	60%	....
Arbitration	89%	82%	90%	91%	67%	92%	89%	....
Compulsory arbitration	58%	46%	62%	56%	22%	63%	58%	....
Grievances carried above immediate superior	84%	68%	90%	92%	73%	88%	89%	73%
Plants with above policy utilizing:								
Personnel dept.	60%	26%	61%	91%	46%	64%	65%	44%
Labor-management committees	25%	9%	28%	32%	18%	26%	27%	18%
Other sources	50%	65%	56%	23%	63%	46%	45%	63%

TABLE XI—TECHNOLOGICAL UNEMPLOYMENT

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Some technological unemployment in 1946 and 1947	17%	9%	27%	....	13%	18%	19%	11%
Use as a criterion for retention on job:								
Seniority	91%	60%	97%	100%	55%	97%	100%	50%
Merit	70%	80%	79%	48%	73%	70%	65%	93%
Dependents	5%	....	....	....	....	....	....	....

TABLE XII—ORGANIZATIONS FOR LABOR-MANAGEMENT COOPERATION

	All Plants	*Small Plants*	*Medium Plants*	*Large Plants*	*Single-Shift Plants*	*Multi-Shift Plants*	*Org. Plants*	*Unorg. Plants*
Organizations present	37%	20%	44%	42%	13%	45%	42%	27%
Number of plants with organizations having them set up as:								
Union-management committees	51%	57%	50%	50%	25%	54%	63%	....
Labor-management committees	33%	....	46%	20%	50%	32%	26%	60%
Some other form	27%	43%	36%	30%	25%	29%	23%	40%
Organizations rated as:								
Good	87%	86%	93%	70%	75%	88%	85%	80%
Doubtful	9%	14%	7%	10%	25%	7%	13%	10%
Unrated	4%	....	....	20%	....	5%	2%	10%

TECHNOLOGICAL UNEMPLOYMENT

The post-war period in the chemical industry has seen the installation of new processes of manufacture, the substitution of continuous for batch operations, and other methods of improvement which might have had a considerable effect on employment in the industry. However, the surveyed plants indicated that while some men were transferred or laid off for this reason in 17% (Table XI) of the plants in 1946 and 1947, the total number of men thus affected amounts to less than one-half of 1% of the total workers in the industry.

While numbers are so small as to enable one to gain little from a plant-type comparison on this score, the criteria that are used to determine who will be transferred or laid off and who will be retained show significant differences. Sixty-seven percent of the plants gave an answer to this question, and the percentages are, of course, calculated from those answering in the various groups. Table XI shows clearly the extensive application of seniority, especially in the larger, multi-shift, and organized groups. In contrast, the smaller and unorganized plants seem to cling much more to the right to apply merit provisions at least partially in laying off or transferring employees.

LABOR-MANAGEMENT COOPERATION

The concept of labor and management working together to solve problems in which they have a common interest has been put forward recently as the panacea in labor relations, and there is no denying that there are examples in which this has worked very effectively, especially during World War II. Under urging from the War Production Board, many plants established labor-management committees to improve co-operation during the war, and many of these organizations have survived in the post-war period. Some such plans ante-dated the war, and a few more have been started in the past two or three years.

Table XII gives some figures on the number of such organizations in the surveyed plants, the manner in which they are set up, and their success to date. While no differences appear among the individual unions as to the percentage having such organizations, the unorganized plants with employee-management groups show a much higher percentage with these groups, (71%), than do the plants with no collective bargaining (17%). A little over half of the plants with these organizations have them set up as union-management committees, representing 27% of the union plants and almost two-thirds of the plants with organizations in the unionized group. Individually among the unions, the United Gas, Coke and Chemical Workers have no plants with union-management committees, while at the other extreme all of the independent union plants with these organizations for co-operation have them set up in this manner.

While about one-third of the plants with organizations specified labor-management committees, 60% of these are in union plants, and there is a doubtful distinction between these and union-management committees, except as set up. A few of these are present in plants also having union-management committees, definitely indicating a difference in organization here. The unorganized plants with employee-management groups show the biggest percentage here, as 80% of these plants with organizations have them of this type.

While over one-fourth of the plans specified some other type of organization, there were many duplications here and the safety committees, job evaluation committees, recreation committees, etc., mentioned, are really union-management or labor-management committees of some type.

In rating the plans for co-operation that are in effect, an overwhelming percentge indicated that they are successful. Reasons given for doubtful ratings centered around lack of employee interest and time for such activities, but it is quite possible that interest and time could be found if employees were convinced of the value of such programs. These plans probably represent a definite step in the right direction in industrial relations, but, since most are comparatively new, their full effect remains to be seen and it will be many years before final judgment can be passed upon them.

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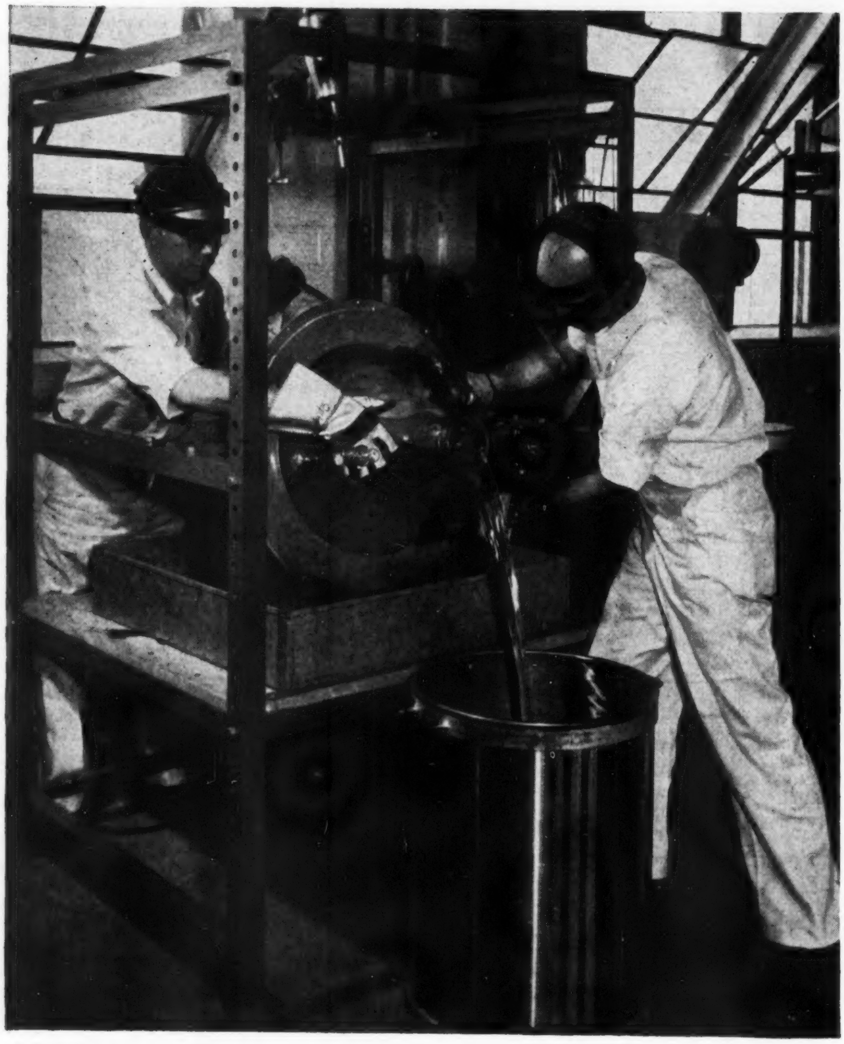

Pivoted cradle makes it possible for authors to empty this fifty-liter flask without removing it from frame.

Proving Chemical Processes in LARGE GLASSWARE

by JOSEPH W. OPIE and WILLIAM J. WARD*

FOR MANY OPERATIONS General Mills has found large glass reaction vessels to be a useful and economical bridge between laboratory and pilot plant.

MORE than eighteen months of successful operation have demonstrated that chemical reactions can be run safely and conveniently in glass apparatus having capacities as great as fifty liters. In addition, a laboratory equipped with large glassware can be a time and money saving preliminary proving ground for chemical processes. At General Mills Research Laboratories, operations at these larger levels have become a useful bridge between the laboratory and the pilot plant, replacing engineering equipment during emergencies, removing some of the load from overtaxed engineering personnel, and serving as a preparation center.

Sometime during most research programs, chemists find it desirable to produce larger quantities of intermediates for further study and to furnish samples of their product for application trials and external market evaluation. Frequently, questions concerning the behavior of the process on an enlarged scale, the handling of intermediates, and potential manufacturing costs arise at this time and are as important to the project as much of the original laboratory data. Although the chemist can often answer his questions and obtain his samples from a suitable pilot laboratory, he frequently finds these facilities already occupied to full capacity. Such a situation invariably causes considerable delay. To meet this specific problem, General Mills established its laboratory equipped with large glass apparatus.

The equipment was assembled in late 1946 to handle numerous projects which required further study, but which were of less immediate importance than other operations then in the pilot laboratory. Originally, the staff decided to limit reactions to those that could be handled either in 12 or 22 liter flasks, since the safety of larger equipment was questionable at that time. However, this equipment was extremely successful, and fifty-liter flasks were soon added to the operation.

Realization of the potential hazards involved led to extreme care in the design and construction of all accessories. General Mills Research Laboratories are equipped with an excellent shop which proved itself invaluable by fabricating an excellent support for the apparatus. The reaction frames are of angle iron welded into a single unit forty inches square by seventy inches high. A transite table top and a suitable arm for supporting a stirring motor, both of which are movable, are incorporated into the frame.

The problem of supporting the flask is solved by using a heating mantle which is held in a cradle. This cradle is pivoted in such a manner that the flask can be tilted and the contents readily poured. Since no suitable stirring gland could be found, one was developed which in addition to sealing the flask allows for entrance of the rod vertically and at any angle up to approximately 30°. The gland is mounted on a stainless steel plate which clamps to the top of the flask and through which such supplementary equipment as cooling coils and gas inlet tubes can be fastened.

One-eighth horsepower air motors are provided for agitation of reactions in twenty-two and fifty-liter flasks, while one-thirtieth-horsepower motors of identical design are used for twelve-liter flasks. Actual stirring is conducted with rods and paddles provided with the motors power being transmitted through a flexible coupling. The stirring rods and a large variety of agitators are readily available in semi-steel, stainless, Monel and Hastelloy, making it possible to handle most corrosive liquids.

No unusual filtration equipment is required. Most filtrations are conducted on table top filters, although a small filter press and centrifuge are available and have been used on occasion.

Thus far, the problem of vacuum distillation has not been encountered. A few concentrations under reduced pressure

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have been conducted in fifty-liter flasks without accident, adequate precautions having been taken. Distillation equipment suitable for handling the quantity of liquid encountered in large glass operation has already been designed and will be constructed if sufficient need for it arises.

Frequently, the economics of this type of operation is questioned, for it would appear to be less expensive in the long run to purchase small kettles rather than spend a similar amount of money in the replacement of broken glassware. If, however, glass equipment is broken, it still has an inherent economy: A flask, for example, can be replaced easily and the equipment restored immediately to operating condition. But if a glass-lined kettle is chipped, it must be sent to the factory for repair. Furthermore, at the time this laboratory was conceived, delivery on kettles of any type was very slow whereas it was possible to obtain immediate delivery of the necessary glassware. In our own experience, no flasks have been damaged during reactions, but two flasks have been broken during the washing operation.

Another argument can be raised in favor of large glass reactors. The glass apparatus can be set up, operated and modified by laboratory workers who are unfamiliar with engineering. As a result, the glass reactor actually increases the flexibility and efficiency of the laboratory staff, for it is not always possible to shift engineers or skilled operators to a project without robbing another of equal importance.

General Mills uses its large glassware laboratory to fill many needs. Originally, the company established the facility as a stop-gap measure to handle preparations until it could complete another pilot plant then under construction. The staff initiated use of the equipment by studying a process for the manufacture of tryptophan in 22 and 50 liter flasks. Through these studies, the Development Research Section of the Laboratories altered the process in several ways to effect economies and assembled accurate cost data on the operation. It also established a limited program for synthesizing a few pounds of the amino acid at a time and checked the reproducibility of the procedures involved. During this work, the staff found that the glass apparatus functions well and is highly suitable for the limited production of small-poundage commodities such as pharmaceutical intermediates.

WHAT HAS BEEN YOUR EXPERIENCE?

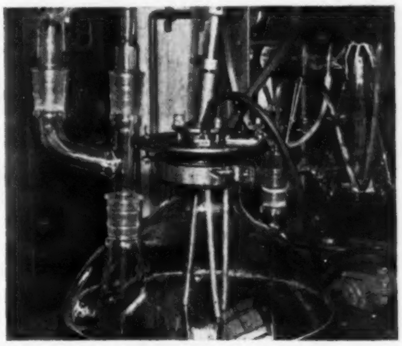
Use of large glassware as pilot plant equipment is not common in the chemical industry. In fact, the set-up of 50-liter flasks described here is probably the largest in existence for this purpose. Because of the growing interest in larger glass units, however, the editors would be glad to hear about experiences other readers may have had with this type of equipment.—Ed.

Later, the equipment proved its ability to save time in an emergency: When it became necessary to "tailor" some blown oils for use in researches under way in the laboratories, the volumes required were such that the reaction could be handled in 22-liter glassware, and work was started immediately. Within two days, the necessary oil had been produced and new information had been obtained. Studies of the reaction on this scale proved to be sufficiently informative to warrant a series of studies at these volumes rather than in small laboratory equipment.

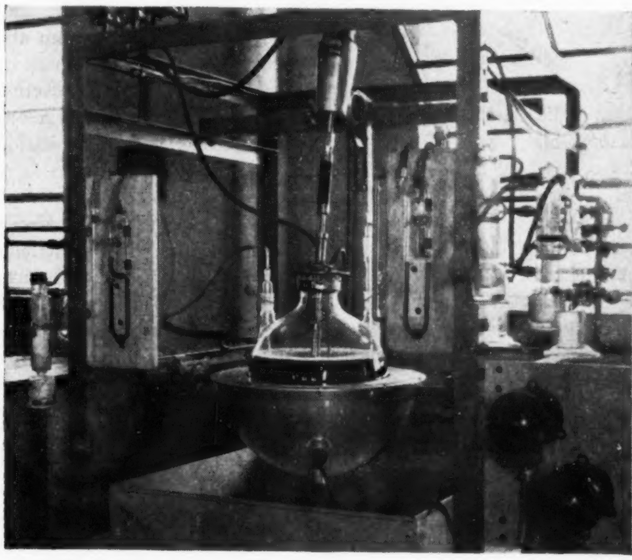
Although this is a special case and does not indicate that reaction studies on such a large scale should be made until all possible information has been obtained from the laboratory, it does show the versatility of glass reactors. As a result of this work, the Development Research Section was able in a short time to offer a new method that may alter commercial plant procedures now in use.

In addition to the products already mentioned General Mills has made waxes, varnishes, plasticizers, pharmaceutical intermediates and numerous other products in glassware and has sold or supplied them as samples for commercial evaluation. The large glass laboratory, however, is *not* a replacement for the pilot plant. Rather, its main purposes are to supplement the pilot plant, to assume part of the preparative load and to serve as a screening center.

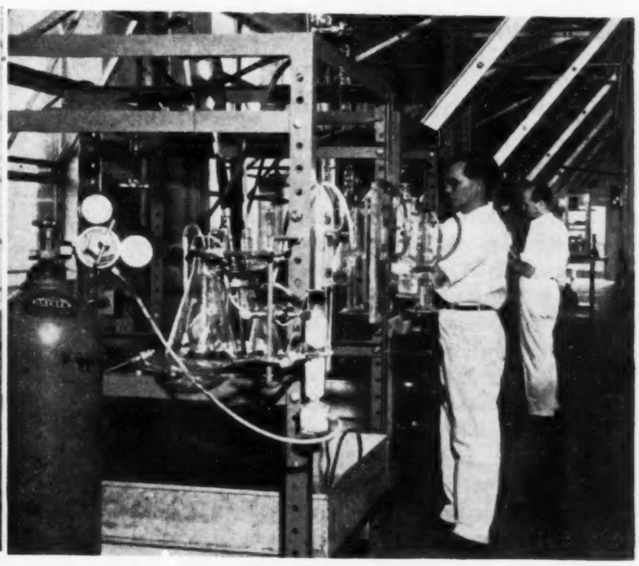
For these purposes, it has proved extremely effective. It places at the disposal of the chemist a facility through which he can expand his operations as he needs larger amounts of material; thus, it frees him from the necessity of calling in an already heavily-scheduled engineering staff. Yet, glass equipment, itself, is inexpensive.



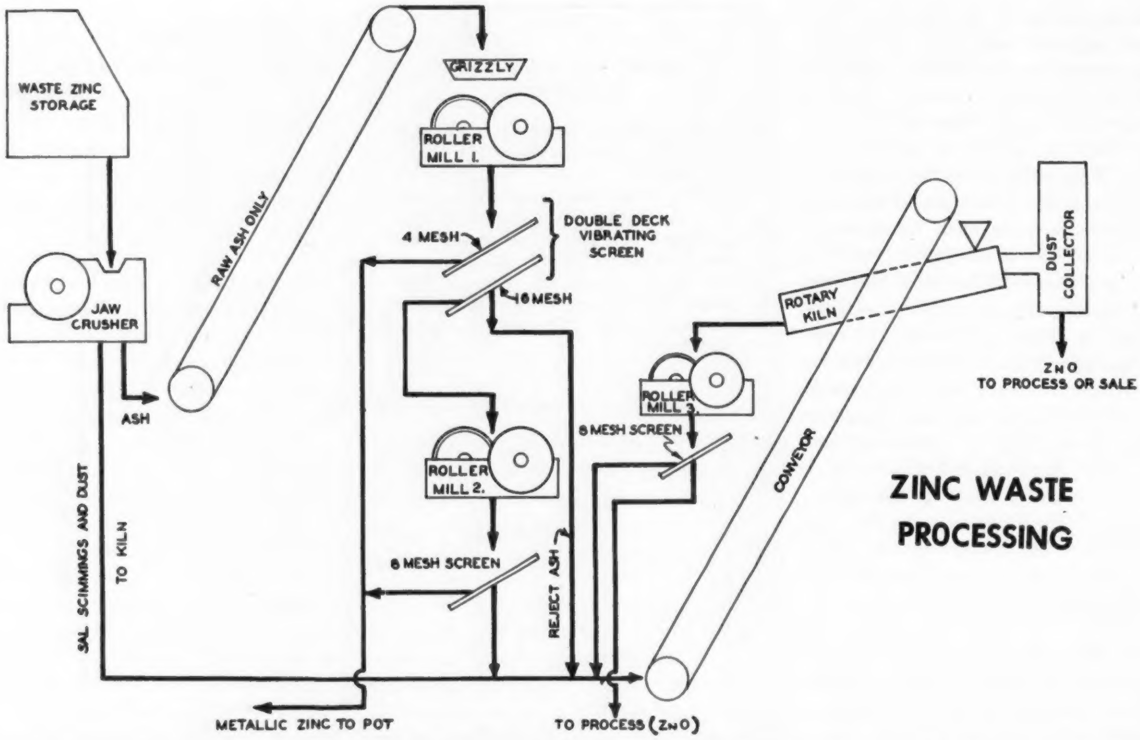
Specially designed gland is used to seal large flask, permits stirrer shaft to enter vertically and at any angle up to 30 degrees.



A large glassware frame in operation. This type of set-up is adaptable to a variety of problems, is easily and quickly altered.



Opie and Ward prepare samples of an amino acid in large glassware lab which they helped design at General Mills Research Laboratories.



ZINC WASTE PROCESSING

STEEL MILL WASTES Converted From Nuisance to PROFIT

EDITORIAL STAFF REPORT

UP-GRADING OF IRON AND ZINC VALUES from pickling and galvanizing operations not only solves a troublesome waste-disposal problem, but does it at a profit. Maneely Chemical Co. is now completing a $500,000 plant at Wheatland, Pa., for that purpose.

THROWING valuable iron into a near-by river is certainly a waste of natural resources under any circumstances. But insult added to injury is the fact that the stream is thereby polluted rather than improved. Now the federal government itself, as well as the several states, is pointing a finger of reproach at stream-polluters (CI, Sept., 1948, p. 373); and steel mills are right in the front row of offenders.

Now the Wheatland Tube Co. and Wheatland Steel Products Co. have come up with a new process which promises to solve their problems at a profit. They started their investigations several years ago, but the war delayed development. After the war, experiments were resumed on a larger scale, and a pilot plant was installed at the plant in Wheatland, Pa. There further developmental work—proving material balances, selecting equipment and materials of construction—was carried on.

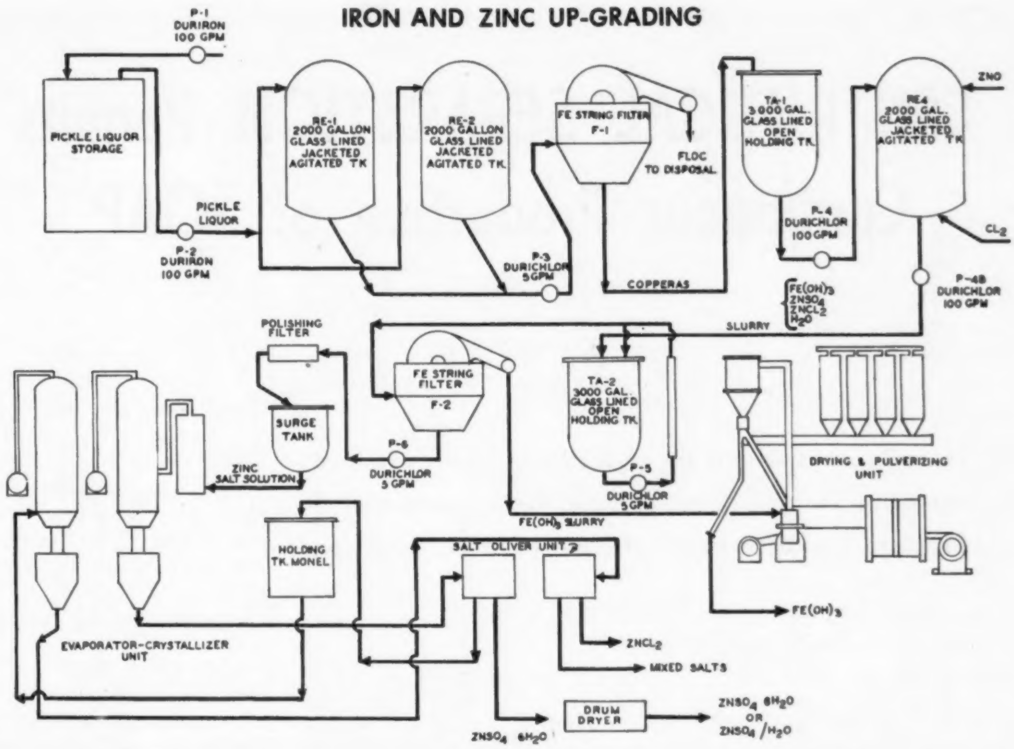
When it was finally concluded that the process was economically feasible, the two companies set up the Maneely Chemical Co., named after Edward F. Maneely, president of the steel companies, which is now building a $500,000 plant scheduled to start operating about the first of the year. The Maneely plant will treat the spent pickle liquors from the two steel fabricating companies with zinc wastes from their galvanizing departments, converting the wastes to valuable iron and zinc compounds. Maneely will also be in a position to service other nearby plants that have a similar disposal problem.

MATERIALS USED

The spent pickle liquor results from treatment of the steel with sulfuric acid and contains up to 1% free acid and up to 22% ferrous sulfate, together with suspended scale, carbon, and other impurities. The galvanizing wastes are the so-called sal skimmings and zinc ash. The former has a zinc content of about 50%, consisting of metallic zinc, zinc oxide, zinc oxychloride, ammonium chloride, iron, and other waste matter. The ammonium and chloride ions come, of course, from the galvanizing flux.

The process boils down to the reaction of zinc oxide with the various anions present to form salts and precipitation of oxidized iron as ferric hydrate.

The zinc waste is broken up with a jaw crusher. The ash is further reduced in a roller mill and passed to a double-deck 4-mesh and 16-mesh vibrating screen. The material larger than 4-mesh is metallic zinc, which is returned to the galvanizing pot. The material rejected by the 16-mesh screen is sent to a second roller mill, after which the portion coarser than 8-mesh is also returned to the zinc pot. The various fines are combined and conveyed to a rotary kiln, where the zinc is converted to the oxide. The product goes to a third roller mill, and the portion which thereafter passes an 8-mesh screen is used for the process. Coarser



material is recirculated to the kiln. A Sly dust collector retrieves fines.

THE PROCESS

First step in the process is a preliminary clean-up of the pickle liquor, which is stored in a 20,000-gal. acid-brick tank. A 100-GPM Duriron pump conveys the liquor to 2,000-gal. glass-lined reactor equipped with a steam jacket and means of agitation. The liquor is heated to about 100° C. A relatively small amount (approximately 200 lbs.) of the finely-ground impure zinc oxide is added, which neutralizes the free acid. In the presence of air, some of the iron is oxidized and precipitated as ferric hydroxide. Since the precipitate is gelatinous in nature, it carries down with it the suspended scale, carbon, silica, etc., leaving the solution clear. A 5-GPM Durichlor pump carries the slurry to a string filter, where the floc is removed and discarded.

CHLORINATION

The purified ferrous sulfate solution (which contains a little zinc sulfate) is held in a 3,000-gal. glass-lined holding tank, whence it is pumped into a closed, 2,000-gal. glass-lined kettle for chlorination and further reaction with zinc oxide. It is again heated to approximately 100° C. and a large amount—3,500 to 4,000 lbs.—of zinc oxide is added. Agitation is started and chlorine is introduced into the bottom of the kettle. Addition of chlorine tends to lower the pH while dissolution of the zinc oxide tends to raise it. It is desirable to carry out the oxidation above pH 4.0 (so ferric oxide will precipitate) and below pH 6.5 (so ferrous hydroxide will not precipitate). Addition of chlorine is controlled automatically, therefore, by a pH meter so that a pH of 4.0-6.2 is maintained throughout the reaction.

After the addition of about 1,100 lbs. of chlorine—requiring about 3 hours—tests will show only a trace of iron left in solution. The resulting slurry, consisting of ferric hydroxide suspended in a solution of zinc sulfate and zinc chloride, is transferred to a holdlng tank. It is then filtered.

The cake is dried in a Raymond flash drier. The product is a bright orange-colored ferric hydroxide valuable as a high-grade pigment. It is feasible (although it is not planned at present) to calcine the hydroxide to produce red iron oxide pigments.

The zinc-salt solution, meanwhile, is sent through a polishing filter to a monel double-effect evaporator, where it is concentrated to the point where zinc sulfate crystallizes out as the hexahydrate. This is separated from the mother liquor by an Oliver filter. The monohydrate can be obtained by dehydration on a drum dryer. An impure salt mixture is next precipitated and zinc chloride is thereafter obtained as a 70% solution. The zinc sulfate and zinc chloride are not contaminated by each other to any appreciable extent.

PROFIT EXPECTED

The $64 question is, of course: Will it pay off? Estimates indicate that not only will the cost of disposal be eliminated, but the process will make a profit in itself. Allowed in the estimates is an over-all depreciation of building and equipment in ten years, allowance for administration and contingencies of 20% of the operation cost, and a selling expense of 10% of the gross revenue. Value of the products has been conservatively estimated, and material losses of 10% have been provided for.

Maneely's venture is not the first attempt to up-grade steel mill wastes. Previous products, however, have suffered from a lack of uniformity that has lowered their value. The close control possible in the present process permits manufacture of uniform high-grade products.

If care and a fine degree of control are exercised, the ferric hydrate becomes a raw material for the manufacture of yellow and red iron oxide pigments or abrasives. Other uses for this material are as a purifier for manufactured gas, preparation of ferric sulfate or ferric chloride for sewage treatment and the preparation of other ferric compounds.

The markets for zinc sulfate as such are somewhat limited but apparently growing. They include agricultural sprays, soil improvement, rayon manufacture, glue, electro-plating and lithopone.

Zinc chloride is used in fluxes, as a wood preservative, and in zinc ammonium chloride and as chromated zinc chloride. It also has a great number of miscellaneous uses.

CENTRIFUGAL SEPARATION Permits Continuous Production of SOAP

by JULIAN C. SMITH
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USE OF CENTRIFUGAL separation in the production of soap has reduced the time in process from ten days to two hours; eliminated production of "nigre"; and increased the concentration of glycerine in the spent lye.

SOAPMAKING has been a batch process—and an art—ever since soap was first used centuries ago. Soap kettles have grown larger and more complex through the years, and the physical and chemical changes that take place have been studied in great detail, but the process is essentially the same as it was in the Middle Ages. Despite all the scientific knowledge that has been gained, soap is still made by master soapboilers: men of long experience who can judge the quality of soap by listening to it, tasting it, pinching it, and by watching the way it slides off a trowel.

This picture is rapidly changing, however, and the batch kettle and the master soapboiler are fast becoming obsolete. Several independent studies of continuous processes, all begun ten to fifteen years ago, have borne fruit in the form of full-scale plants. The Procter and Gamble process[4] was described in April, 1947, and five months later pilot-plant data for the Colgate-Palmolive-Peet process were published.[1] Now the Sharples process has become a third important development in the history of modern soapmaking.

The P & G and Colgate processes are similar except that one employs a catalyst and the other does not. They both involve high temperatures (490°F), high pressures (600-700 psi), and rather elaborate equipment. The process steps are not the same as those in the batch kettle; instead, fat is hydrolyzed with water to aqueous glycerine and free fatty acids. The fatty acids are subsequently distilled and neutralized with caustic to produce neat soap.

The Sharples continuous centrifugal process follows the same path as the traditional kettle process. Fat is continuously saponified with caustic to produce glycerine and neat soap. No catalyst is used. The equipment is simple and small, and the pressures and temperatures are low. Even so, through effective mixing, rapid separation, and close control of conditions, fat is turned into soap in a very few hours. The holdup of material in the system is therefore small. The soap is exceptionally clean, the yield is high, and considerable savings in investment and operating costs can be realized over the batch kettle process.

Intensive work on the development of the centrifugal process was started in 1940 with laboratory work to study the physical nature of the materials met with in the various stages of saponification. As a result of this work continuous mechanical mixers were designed and built and used in conjunction with Sharples Laboratory Super-Centrifuges for separation. With this small pilot plant equipment many runs were made with continuous operation extending over periods of five or six hours.

Recognizing that further development required operation on a larger scale and with an ample supply of raw materials and outlet of semi-finished products, an agreement was reached with Lever Brothers Co. in 1941 to erect a pilot plant using commercial size Sharples Super-Centrifuges for the separation, and auxiliary equipment of a size to match, in Lever's plant at Baltimore and to continue the development with the collaboration and the assistance of Lever Brothers Research Department. This pilot plant finally evolved into a complete unit capable of continuously saponifying approximately a ton of fat per hour and delivering continuously neat soap and spent lye and capable of operation for many days without stopping.

As a result of its successful experience with the unit on which the process was developed Lever ordered a large plant for installation at Baltimore in 1946. This has now been in commercial production something over a year, and Lever has signified its intention to expand its use to other plants.

The process was released for general sale in the United States only a few months ago, but already a number of plants are on order, and several are under construction. Ten different countries are represented among this group.

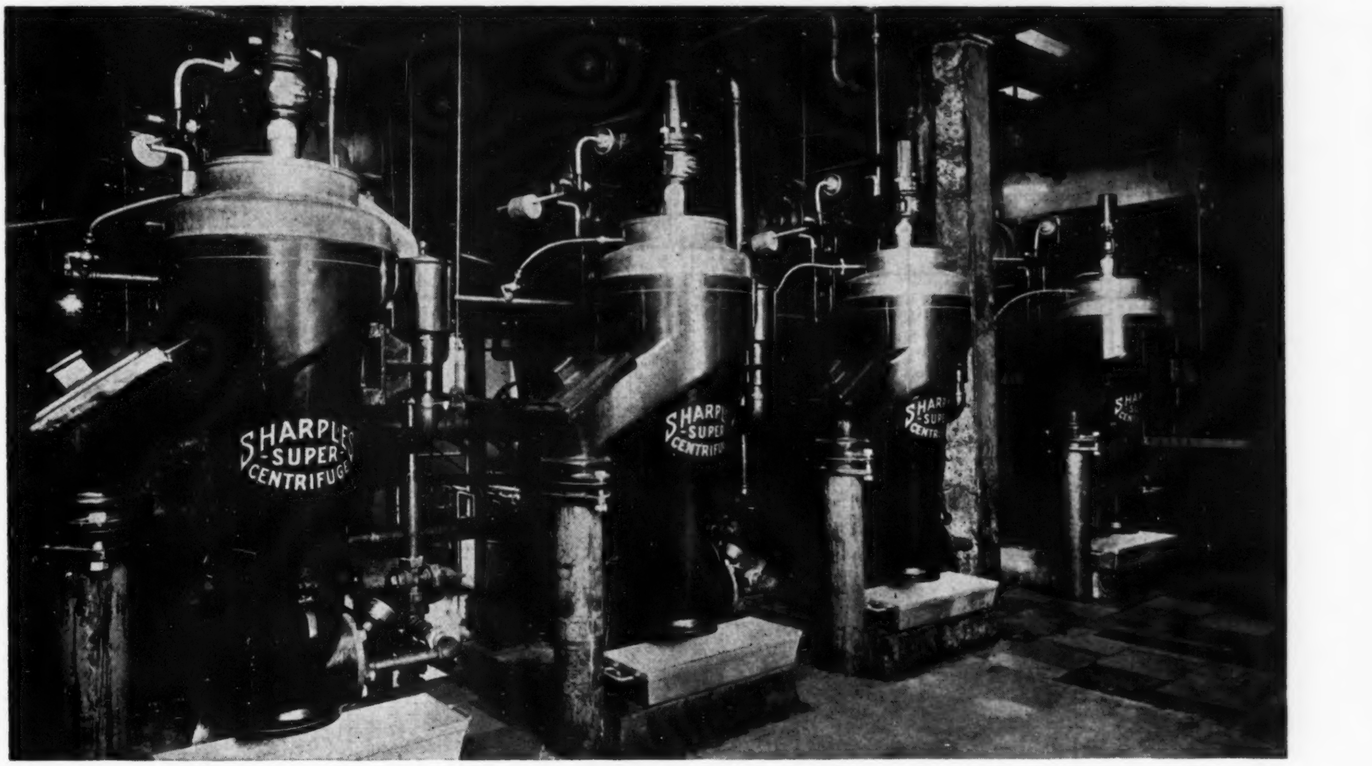
SAME STEPS AS BATCH PROCESS

Soapmaking, both by the Sharples process and the "full-boiled" kettle process, consists of reacting fatty material with caustic soda in the presence of salt, and subsequently washing the glycerine and spent lyes out of the soap. This is done in a number of "changes." In the first "change" or stage, fat is almost completely saponified into glycerine and the sodium salts of the fatty acids. Two layers are formed: spent lye, containing glycerine and most of the salt; and grained soap, which contains some unsaponified material, some salt, and a little caustic. These layers are separated, and the spent lye is sent to the glycerine recovery house.

In additional "changes," the grained soap is agitated with additional caustic to complete the saponification and the two layers are again separated. The remaining "changes" adjust the salt and caustic content to give the best final separation and to change the texture of the soap from grained soap to a less crystalline form. The product from the last stage is known as neat soap, which is slabbed, flaked, or spray dried into the desired final form.

In the batch process[3,5] these changes take place in a very large cylindrical kettle, often cone-bottomed to facilitate separation of the layers. Modern kettles are heated with both open and closed steam; the open steam also serves to agitate the contents of the vessel. Soap kettles are 15 to 30 feet in diameter, and 30 to 60 feet high, and may hold several hundred thousand pounds of material on a ten-day cycle. They are usually made of low-carbon steel with a top section of Monel, nickel-clad steel, or stainless steel. The investment, therefore, both in the kettle itself and the material in process, is large.

Fat and lye are fed to the kettle while the contents are being boiled and thor-



Super-centrifuges, developing a force 13,200 times that of gravity, effect the separation of the soap from the lye and glycerine.

oughly mixed with open steam. The soapboiler adjusts the feed rates to keep the mass in a smooth, comparatively thin condition, and follows the course of the reaction by the sound of the splashing soap. After saponification is substantially complete, salt is added to cause the soap to separate from the spent lye. The layers are settled, and the spent lye is drawn off. The remaining grained soap is then boiled several times with caustic, salted out, settled and separated. The soap is finally "fitted" to neat soap in the finishing "change." In this last step great care is taken to insure that a correct phase relation is obtained, giving, at the end, a neat soap containing a small amount of alkali, and a nigre, low grade soap, phase.

It is this final "change" in particular that requires good judgment and long experience on the part of the soapboiler. Under the proper conditions the kettle contents finally separate into two layers: a top layer of good soap, a lower layer of low-quality soap known as "nigre." Most of the nigre results from degradation of the soap caused by keeping it hot for several days. If conditions in the kettle are not correct at the end, a troublesome additional layer known as "middle soap" is sometimes encountered.

These operations, as might be expected, take a long time. Although the initial saponification is rapid, filling a soap kettle takes several hours, and the first settlings and separations may each take a day. Typically the finishing "change" is begun on the fourth day, and consumes several days; the final separation takes from one day to a week. The total time required to change fat into neat soap is ten days or two weeks.

LOW HOLD-UP

In contrast, the change from fat to neat soap in the Sharples process takes less than two hours, whereas in the kettle process, eight to ten "changes" are required. Equivalent results are obtained in the Sharples process continuously in four stages. The four stages are carried out in small separate units, and are under automatic control at all times. In each stage the reactants are mixed in a small, well-agitated vessel, and the liquid layers are separated in high-speed centrifuges. Because there is no prolonged holdup of hot material there is almost no degradation of the stock, and no nigre need be discarded. In addition to separating the liquid layers the centrifuges throw down any dirt and insoluble impurities that find their way into the system, so that the neat soap is cleaner and brighter than can be produced by the kettle process.

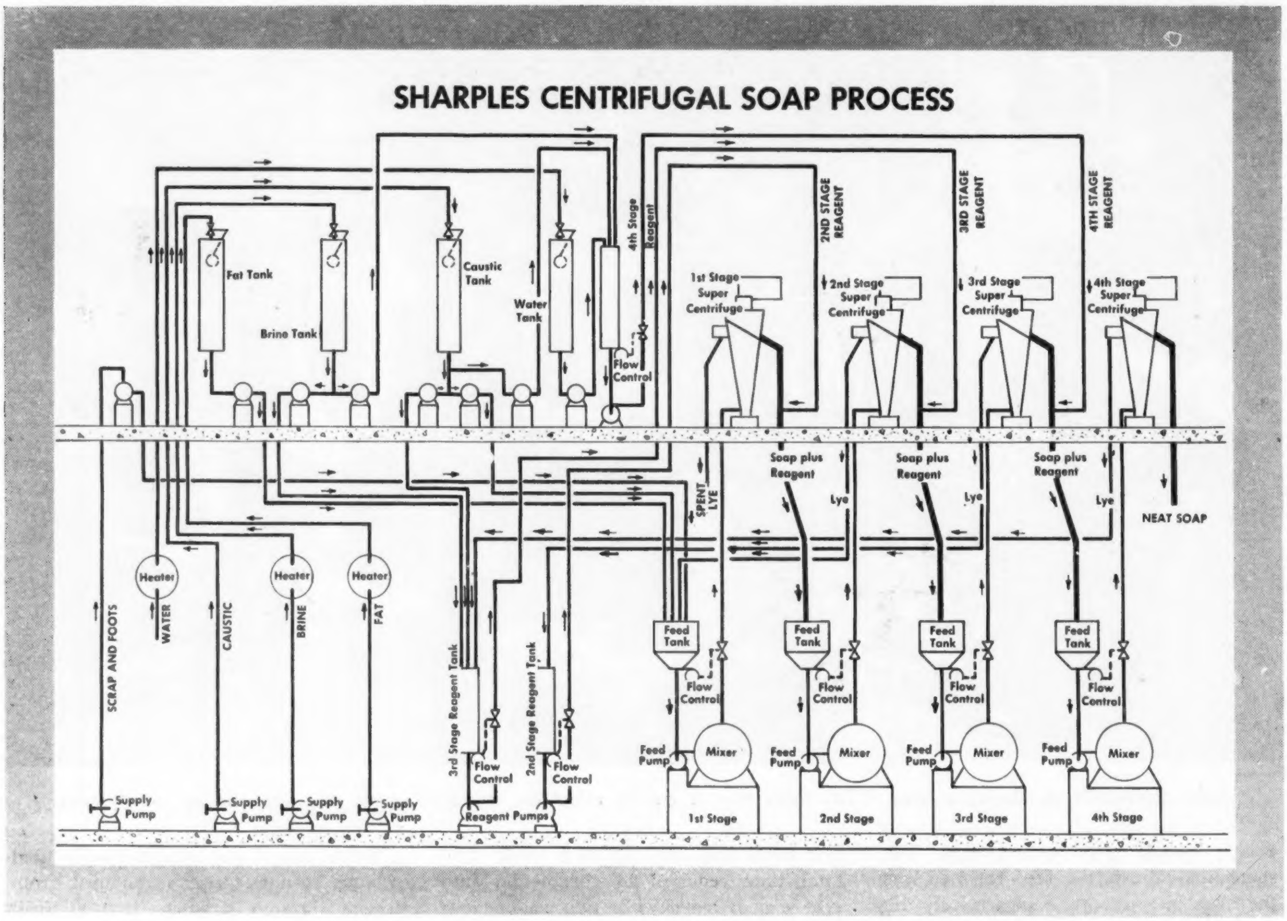
The process consists of four continuous stages, with soap and lye traveling counter-currently. The spent lye from each stage, sometimes butted up with additional caustic or salt, becomes "reagent" for the preceding stage. The first stage accomplishes about 95% of the saponification; the second stage completes the reaction and does some washing; the last two stages are washing steps to adjust the caustic and salt contents to the desired values.

Molten fat of any type normally used by soap manufacturers is pumped from storage through strainers into a small constant-level tank. From here a proportioning pump takes it to a storage heater where it is heated to 200°F. It then passes through a constant-weight feed tank into the first mixer. As mentioned before, in the Sharples process no nigre is discarded, nor are there any skims (contaminated material skimmed from the surface of a kettle charge); however, if nigre and skims are available from other operations, they can be added through an auxiliary feed system. The recycled fat, like the new fat, passes through strainers and a proportioning pump into the mixer. The third stream entering this mixer is "fiirst-stage reagent"; i.e., spent lye from the second stage plus 50% causttc.

The products from the first mixer, spent lye and grained soap, are separated in a Sharples Super-Centrifuge. The spent lye contains almost no caustic and a high percentage of glycerine (see Table I); it is sent to the glycerine recovery house. The grained soap is flushed out of the centrifuge with second-stage

TABLE I—COMPOSITION OF PRODUCT[2]

Component	*Sharples Process*	*Kettle Process*
Neat Soap		
Total fatty acid	62.8%	62.9%
Free Na_2O	0.06–0.10	0.06–0.10
NaCl	0.4–0.5	0.4–0.5
Glycerine	0.36	0.5–0.8
Spent Lye		
Glycerine	15–90%	4–6%
Na_2O	0.02–0.05	0.5
NaCl	8–12	18



reagent, and the two liquids pass to the second mixer. The products are separated in a second centrifuge; the lye is butted up with caustic and becomes the first-stage reagent, and the soap is mixed with third-stage reagent in the third mixer. Once again the liquids are centrifuged. The lye becomes the second-stage reagent, and the soap passes to the fourth or finishing stage. Here, by mixing with caustic and brine, it is "fitted" into neat soap. A final centrifuge separates the lye or nigre from the neat soap; the lye and nigre become the third-stage reagent, and the neat soap is sent to storage.

MULTI-UNIT CONTINUOUS REACTOR

All of the mixers are multi-compartment mixers to prevent bypassing of feed from the mixer directly to the outlet. The first stage mixer is of a larger size than those used in the other stages in order to obtain the bulk of the saponification in this first stage. The temperature in this mixer is approximately 220°F.

The mixers used in the second, third, and fourth stages are similar to the first-stage mixer, but smaller. In each the contents are heated about 5°F, to compensate for the cooling in the system.

CENTRIFUGAL SEPARATION

The centrifuges are No. 16 Sharples Super-Centrifuges. They operate at 15,000 r.p.m. and develop a centrifugal force of 13,200 times gravity. In the smallest plant one centrifuge is used in each stage; in larger plants several machines are used in parallel. The feed liquids enter at the bottom of the vertical bowl, and as they pass upward under the influence of the tremendous centrifugal force, the phases are rapidly and completely separated. Any solid material in the feed is thrown down and accumulates in the bowl. The heavy lye phase escapes from the bowl and is collected in the upper cover of the machine; soap is ejected into the lower cover, which is specially designed to permit easy flow. Even so, the grained soap from the first three stages is far too viscous to flow by itself, and must be flushed out of the centrifuge.

The ingenious flushing procedure, a seemingly small thing in itself, is one of the keys to the success of the process. Reagent for the following stage is fed into the top of each centrifuge in such a way that it strikes the top of the rotating bowl, and is spun out into the upper discharge cover. Reagent and grained soap thus both strike the roof of the cover with considerable force, and become sufficiently well mixed to permit the soap to flow out of the centrifuge into the next mixer. In the finishing stage the neat soap is sufficiently fluid at 220°F to flow by itself, and no flushing liquid is required.

Another reason for the success of the process is the close automatic control of the flow streams. All feeds are added through proportioning pumps, and the flow rates between stages are held constant by flow controllers. There are eight duplex piston-type proportioning pumps, of various sizes appropriate to their load. Two pumps operate on fat, three on 50% caustic, two on 20% brine, and one on water. All eight pumps are pneumatically driven from a single four-way control valve, so that their pistons operate in unison. The total rate of throughput is adjusted by changing the speed of the control valve; individual flow rates are varied by adjusting the stroke of the piston in the corresponding pump. Between stages the feed to each mixer passes through a cone-bottomed weigh tank with about 5 minutes' holdup of material, and then through a small centrifugal feed pump; the weight of the tank contents is kept constant by a control valve on the pump discharge. The temperatures of the feed streams and in the mixers are also automatically controlled. In addition, the equipment is generously supplied with indicating gages, relief valves, and an elaborate system of alarms.

Because the equipment throughout is small, it is economically feasible to make it all of corrosion-resistant materials. Hot fat is handled in stainless steel. Brine and lye are handled in nickel or nickel-clad equipment. The proportioning pumps

are made of nickel alloys, stainless steel, or Durimet; the centrifuge bowls are Inconel, and the covers are stainless steel. Contamination of the stock by corrosion products is therefore negligible, and the expected life of the major pieces of equipment is over 25 years.

OPERATION IS SIMPLE

The operation of a Sharples soap plant, in comparison with that of a kettle plant, is exceedingly simple. The operators do not need long experience nor extraordinary skill. Little labor is required; the smaller plants can be run by one man per shift, and he is not very busy. Every half hour he measures the alkalinity of the spent lye from the first-stage mixer, and adjusts the caustic proportioning pump if necessary. All flow streams are sampled for analysis once a shift or when the fat supply tank is changed. About once a day the accumulated solids must be removed from the bowls of the first-stage centrifuges, and about once a week from the other machines.

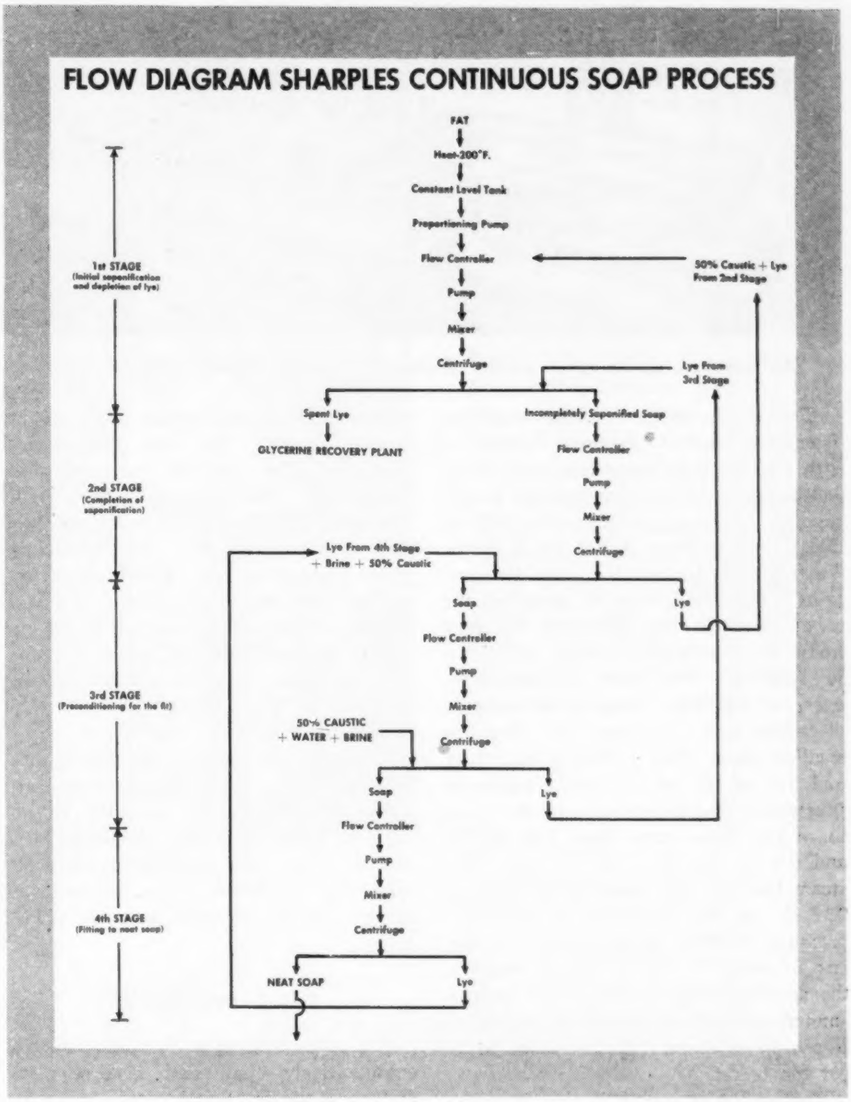
There are no other routine duties, and the alarm system immediately indicates when anything goes wrong. High-low alarms are provided on the weigh tanks and constant-level tanks. A device sensitive to the number of pulsations per minute of the proportioning pumps tells the operator when a line is plugged or when there is too wide a variation in any rate of flow. Each alarm sounds a buzzer and lights its own light, which stays on until the trouble is remedied.

Cleaning a centrifuge bowl takes about 20 minutes, but extra bowls are provided so that a machine need be taken off stream only for the time required to remove the bowl and replace it with a clean one. In the larger plants, with three or more centrifuges in each stage, a bowl may be changed without shutting down the equipment, since the other centrifuges can take a temporary overload. In small plants all flows must be stopped. Because of the integrated automatic controls this can be done easily and rapidly; the flows can be shut off, the bowl changed, and the plant back on stream, all in about 5 minutes.

In spite of the ease of starting up and shutting down, it is not feasible to operate a Sharples plant only one shift a day. To realize the advantages of the process operation must be around the clock. Some plants have been designed to run 7 days a week, with periodic shutdowns for inspection and repairs; others are operating on a 5-day week. Which of these methods is best depends on conditions at each specific plant.

MANY ADVANTAGES CLAIMED

The Sharples continuous process is said to have many advantages over the traditional kettle process, in that it produces a higher yield of better quality



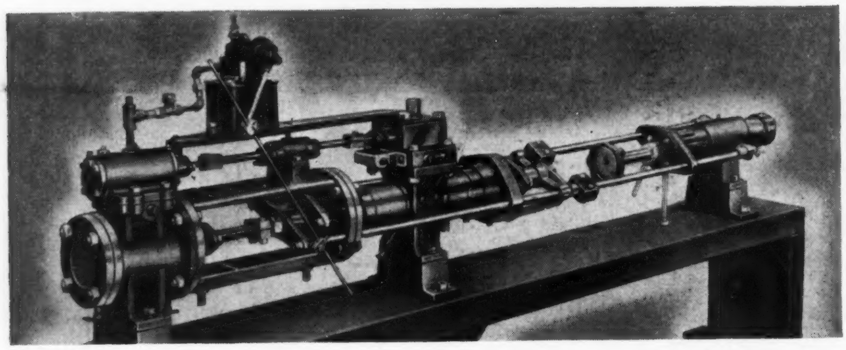
products with savings in steam, operating labor, and maintenance. Detailed comparison with the other continuous processes is not feasible because of the lack of information regarding them. High-pressure hydrolysis yields a fairly concentrated aqueous glycerine directly; the spent lye from the Sharples process, although high in glycerine, contains considerable salt which must be recovered and recycled. However, the Sharples process has the advantages, particularly significant to smaller manufacturers, that the equipment is simple, the investment required is low, and the process follows the familiar steps.

The products from the Sharples process are unquestionably better than those from a soap kettle. The neat soap is extraordinarily bright and clean, since the fat is heated only one or two minutes before saponification, corrosion-resistant materials are used throughout, saponification is done rapidly in a small closed vessel, and the soap is clarified four times under high centrifugal force. Packaged products made from Sharples neat soap are very stable for the same reasons.

Only two products are formed in the Sharples process; neat soap and spent lye. It is not necessary to discard or degrade any nigre because of the minimum contamination and repeated clarification of the materials in process. If nigres are formed, they are recycled. The yield of high-quality soap is therefore higher than from a kettle plant.

The lye ratio (lb. of lye per lb. of soap) is 0.36 in the Sharples process, compared with 1.00 in the kettle process. Thus much less spent lye is produced. The spent lye contains less organic matter, other than glycerine, than does kettle-plant lye, because of the clean-cut separation between soap and lye, and because only very small quantities of lye-soluble degradation products are formed.

The glycerine content of the spent lye is twice to three times that of kettle-plant lye, and the salt content is considerably lower. It is thus economical to recover a higher percentage of the glycerine than in a traditional plant. Much less salt need be handled, and where the spent lye is treated with sulfuric acid, much of the salt normally discarded can be saved. The neat soap is so clean that no bleach is needed.



Air activated, double-action positive displacement pumps proportion the reactants.

One of the largest savings accruing from the Sharples process is that of steam. The large quantities used in the kettle process have been reduced to the amount necessary to heat the feed to 200°F and to keep it hot for 2 hours. Furthermore, because the spent lye contains a high percentage of glycerine, the steam load in the glycerine recovery house is considerably reduced, as shown in Table II. The steam savings, however, are partially offset by increases in electricity and compressed air. For the smallest plant, 0.022 KWH of electricity and 1.2 cu. ft. of air (at a minimum pressure of 40 psi gage) are required per lb. of fat; for a large plant, 0.01 KWH and 0.4 cu. ft. of air are needed. The steam load for neat soap manufacture of 0.17 lb. per lb. of fat (at a minimum pressure of 40 psi gage) applies to any size of plant. Table III shows that for the smallest plant typical power savings amount to $0.88 per ton of fat processed. For a large plant they are about $1.10 per ton of fat.

Another large saving is that in operating labor. One man per shift can operate a small Sharples plant, instead of the three required in a kettle plant of the same capacity; in even the largest Sharples plant only two men per shift are needed. Most important, perhaps, is the fact that No. 2 soapboilers with a few weeks of training can consistently make high-grade soap. The years of experience and the trained eyes, ears, and tongue of the master soapboiler are no longer needed. Table III shows that for a small Sharples plant a labor saving of over $4.00 per ton of fat could reasonably be expected.

A saving less easy to evaluate is that in maintenance. Since corrosion-resistant alloys are exclusively used the repair costs in a Sharples plant should be low, and the life of the equipment should be long. Data on which to base an estimate of this saving, however, are not available.

SMALL INVESTMENT

The investment in a Sharples plant is comparatively small, both in equipment and in working capital. Only a small building is required to house even a large plant, as shown in Table IV. The holdup of 2 hours instead of 10 to 14 days means that little money is tied up in materials in process. The equipment, although made of expensive alloys, is so small that its cost per ton of productive capacity is low.

These savings are most significant when a new plant or a plant expansion is being considered, but it is claimed they are often large enough to justify replacement of an existing plant without changing the production rate. The economies are said to be appreciable for throughput rates as low as 3,000 tons of fat per year. A secondary advantage results when an existing plant is expanded: since the spent lye from the Sharples process is high in glycerine and low in salt, the capacity of an existing glycerine recovery house can often be doubled without any changes in equipment.

TABLE II—STEAM CONSUMPTION

	Consumption—lb./1000 lb. fat	
Step	*Sharples Process*	*Kettle Process*
Neat Soap Mfg.	170	1500
Glycerine recovery	230	700
Total	400	2200

TABLE III—LABOR AND UTILITIES COST FOR 1500 LB. FAT PER HOUR

	Kettle Process	*Sharples Process*
Utilities		
Steam-lbs.	3300	600
Cost of steam @ $0.50/1000 lb.	$1.65	$0.30
Electricity: 44 KWH/ton fat @ 7 mils	....	0.23
Compressed air: 2400 cu. ft./ton fat @ $0.03/1000	....	0.07
Total Utilities Cost	$1.65	$0.60
Operating Labor		
No. 1 soapboiler @ $1.80/hr.	$1.80	....
No. 2 soapboilers @ $1.50/hr.	3.00	$1.50
Labor cost, $/hr.	$4.80	$1.50
Total	$6.45	$2.10

TABLE IV—BUILDING REQUIREMENTS

Plant No.	*Throughput—Lb. fat/hr.*	*Building Dimensions—ft.*	*Remarks*
1	1500	25 x 35 x 33	2 floors + balcony
3	4500	25 x 45 x 40	3 full floors
6	9000	40 x 50 x 45	3 full floors

ENGINEERING DESIGN

All important aspects of the process are covered by patents assigned to the Sharples Corporation,[6] which now designs and engineers complete plants for making neat soap. So far ten sizes of plant have been engineered, from No. 1, rated at 1,500 lb. of fat per hour, to No. 10, rated at 15,000 lb. per hour. The number of the plant corresponds to the number of centrifuges used in parallel in each stage.

Any desired grade of laundry soap or toilet soap can be produced. The plants are also flexible as regards production rate; satisfactory soap can be produced at any rate down to one-quarter of the designed capacity.

The engineering has been exceedingly thorough. Details such as weigh tanks, alarms, centrifuge covers, pumps, and so forth received close critical attention. The bugs were taken out of the process during development. As proof, the Sharples Corporation offers the fact that when the first large plant was started, it took only 20 minutes to make specification-grade soap, and the plant has operated satisfactorily ever since.

The design drawings, also, are unusually complete. Even the smallest item is specified in detail, resulting in a bill of material that runs to 62 pages. Supplementary lists for each craft itemize materials in the order in which they occur between pieces of equipment. Detailed two-line piping diagrams are supplied for each piece of equipment, with single-line drawings tying the equipment together. The work involved in supplying such detail has more than paid off in speeding up construction and eliminating errors.

It is hardly surprising, therefore, that the process is finding rapid acceptance among soap manufacturers. Lever brothers owns the only plant now operating in the United States. The process was only released for sale in this country in July 1948, but already several plants are on order. In addition, more than 15 plants are on order or under construction in other parts of the world, including Canada, Mexico, Egypt, India, and several European and South American countries. Should the present trend continue, the art of the master soapboiler will soon be forgotten, and the soap kettles of today will follow the kerosene light and the Stanley Steamer into history.

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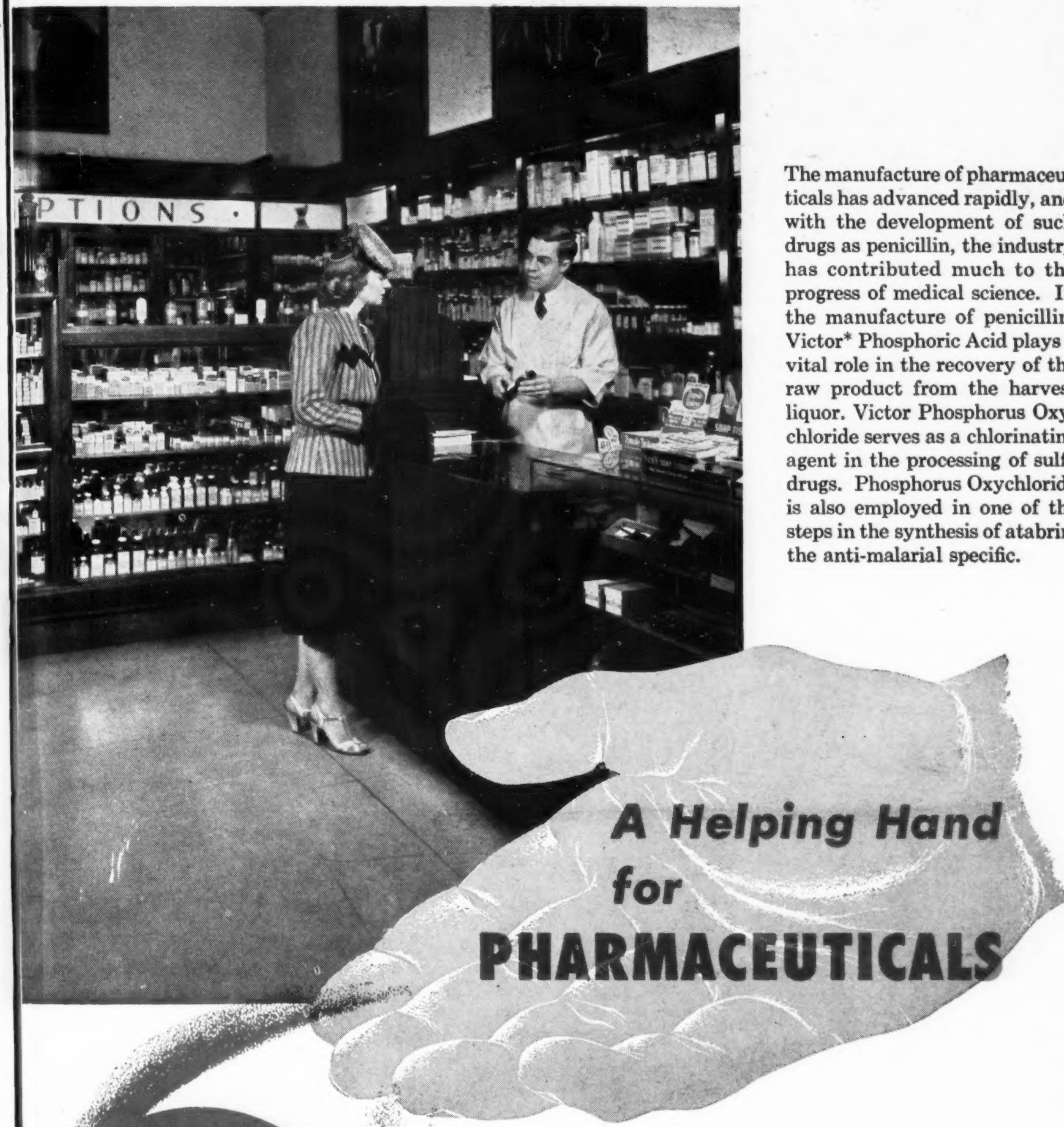

The manufacture of pharmaceuticals has advanced rapidly, and with the development of such drugs as penicillin, the industry has contributed much to the progress of medical science. In the manufacture of penicillin, Victor* Phosphoric Acid plays a vital role in the recovery of the raw product from the harvest liquor. Victor Phosphorus Oxychloride serves as a chlorinating agent in the processing of sulfa drugs. Phosphorus Oxychloride is also employed in one of the steps in the synthesis of atabrin, the anti-malarial specific.

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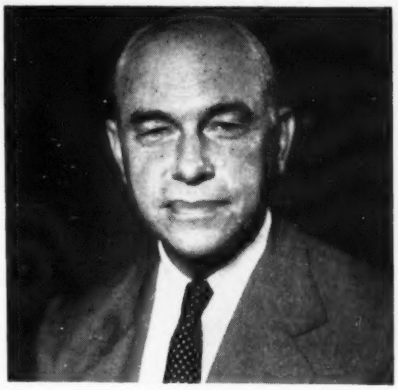
THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

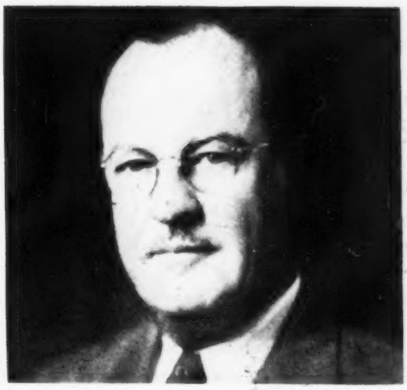
PEOPLE



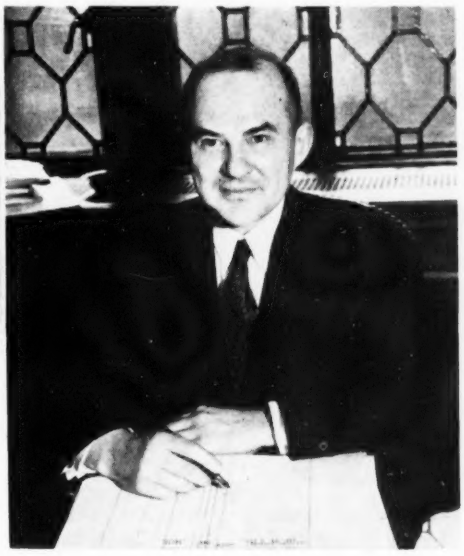
Edward Wichers, recently named chief of the Chemistry Division, Natl. Bureau of Standards.

James A. Rafferty, Union Carbide vice pres., awarded the S.C.I. Chemistry Industry Medal.

Roy C. Newton, vice president in charge of research for Swift and Co., receiving the Honor Scroll of the American Institute of Chemists from Lawrence Flett, president of the Institute.

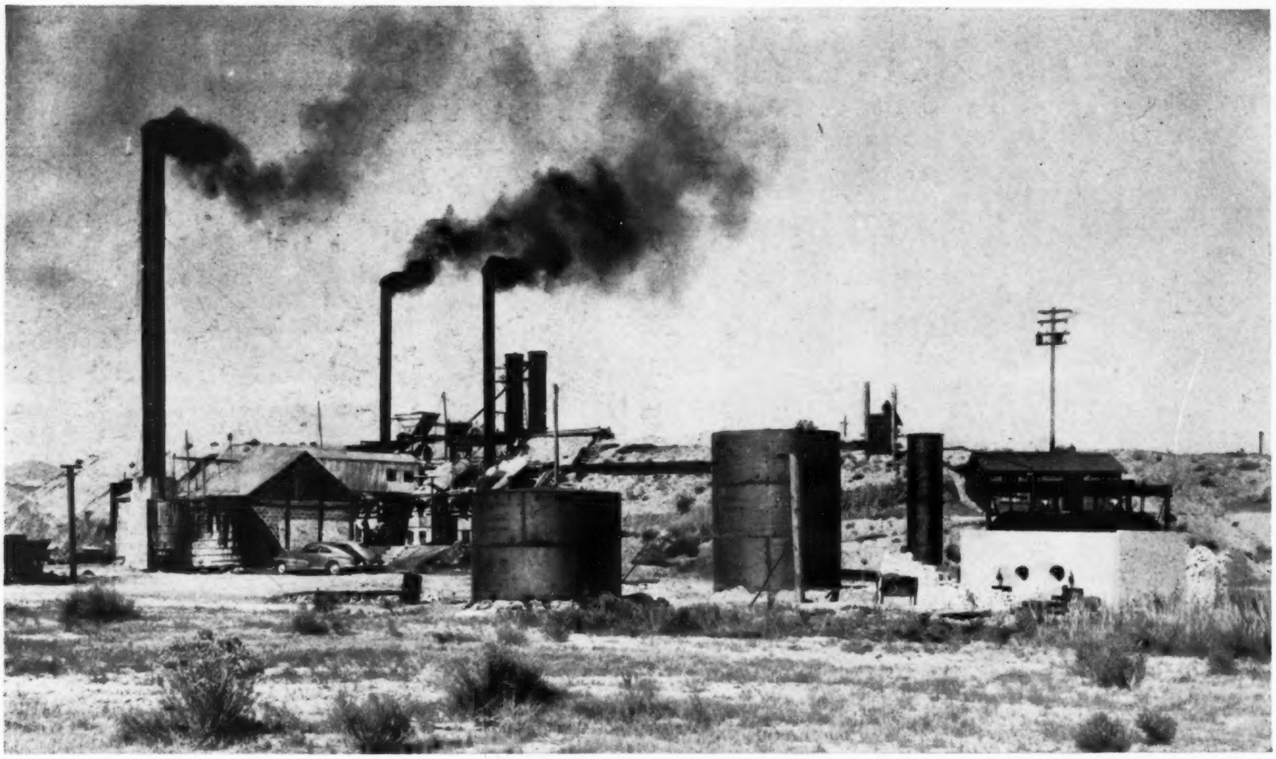


Osborne Bezanson (top) and R. R. Cole, vice presidents of Monsanto Chemical, elected to the company's executive committee



Otto L. Schweng, named to the newly created post of director of market research, Diamond Alkali Co.

Norris D. Embree, appointed director of research, Distillation Products, Inc. He joined Eastman Kodak in 1934 to work on a project that resulted in the establishment of D. P. I.



The Records plant in partial operation, using coal as heat energy source. When the plant is in full operation, the by-product gas will be used for heat energy. In the foreground are tar breakdown stills under construction. The boiler house for distillation steam source is at left.

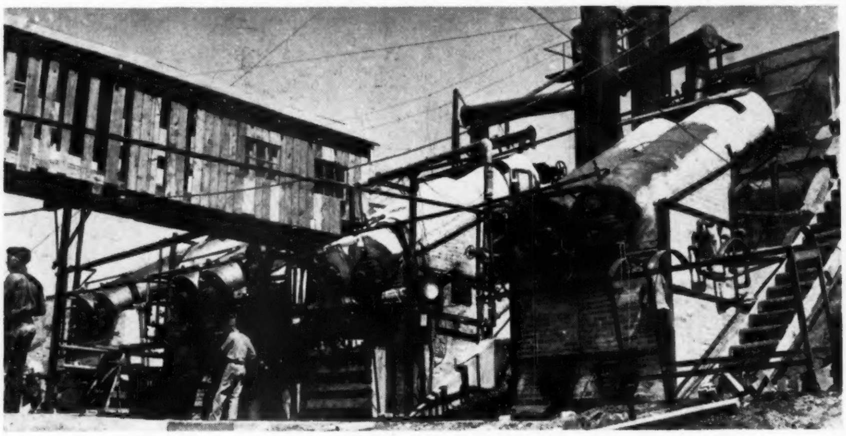
Utah Plant Makes Smokeless Fuel

A high-grade smokeless fuel (called char) is being made from coal by the Records coal-processing plant at Wellington (Carbon County), Utah. This plant utilizes the Records Industrial Research Laboratory's patented process for low-temperature carbonization of coal. Utah coal is plentiful and cheap, and the fuel produced is not expensive. It is one of the more promising answers to the demand for a cheap, solid smokeless fuel. One ton of the coal yields 1,300-1,400 pounds of char.

Besides the char, each ton of processed coal yields 40-48 gallons of tar oil, 75 gallons of ammonia liquor and 4,000 cubic feet of gas.

The yield of tar—raw material for dyestuffs, aspirin, sulfa drugs, and thousands of other products—is increased by as much as 400 per cent in low-temperature coking.

Advantages are seen in low-temperature coking for the production of pulverized fuel for boilers. Still another highly promising but as yet undeveloped field is in the chemical and metallurgical industries. Low-temperature coke is an extremely reactive source of carbon, so much so that for many purposes it is a substitute for charcoal.



The discharge end of the inclined retorts at the Records coal processing plant. There are four benches of these, each bench made up of two retorts. These benches are just below the main gas condensers.

Coal storage and retort loading point for the plant. An operator is loading the coal hopper which holds about 3 tons of coal. The capacity of the hopper is a little greater than the capacity of the retorts.

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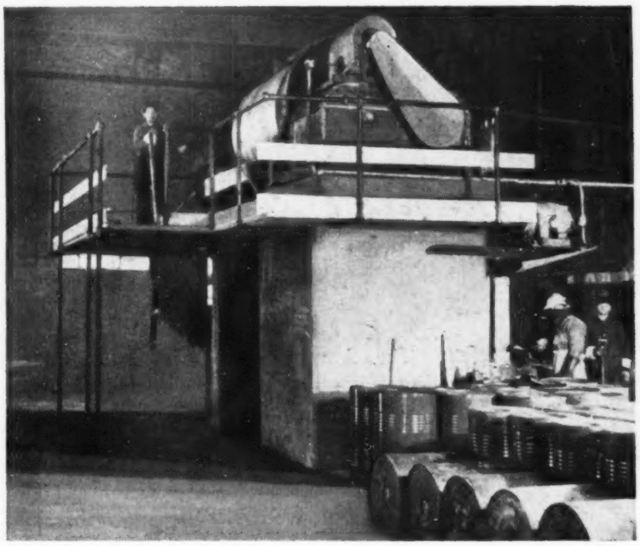

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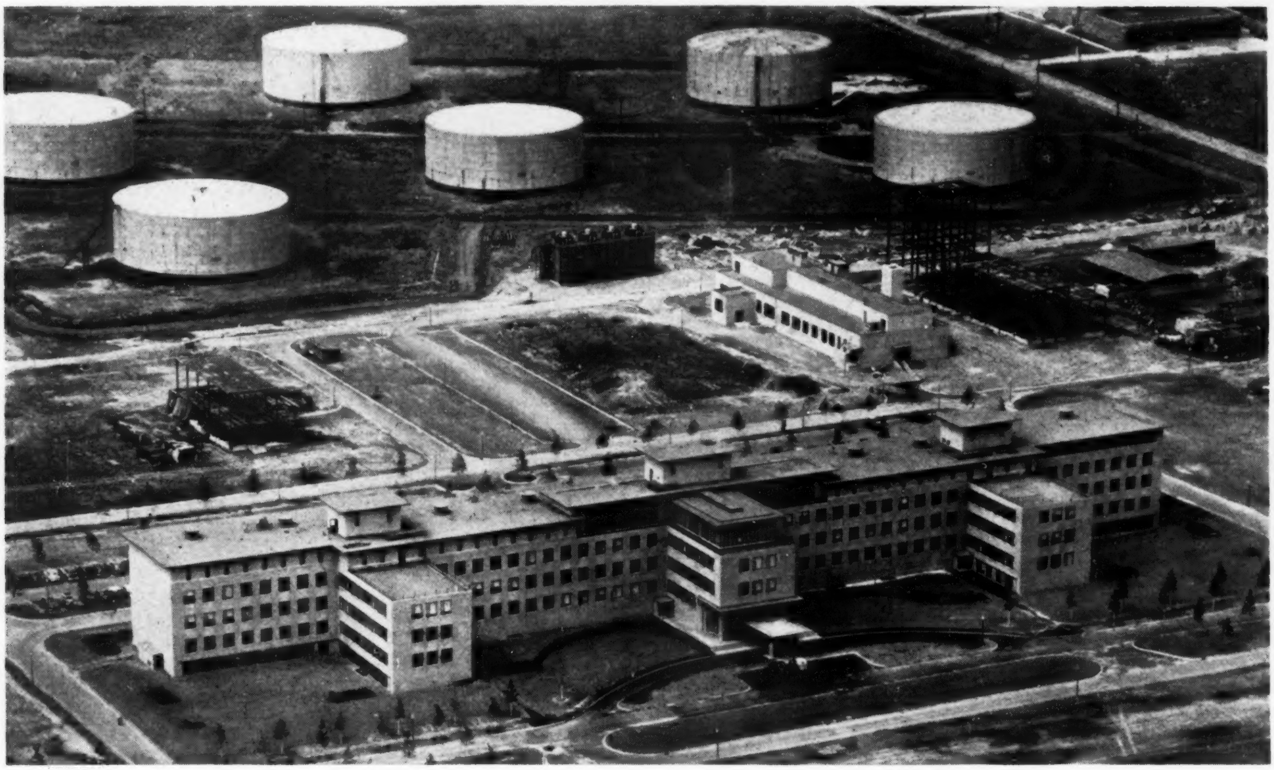

Air view of the Research Center. The library occupies the glass enclosed center portion. An auditorium seating 150 persons has specially designed acoustical features that permit a normal speaking voice to be heard from any part of the room without amplification devices.

Esso Opens Petroleum Research Center

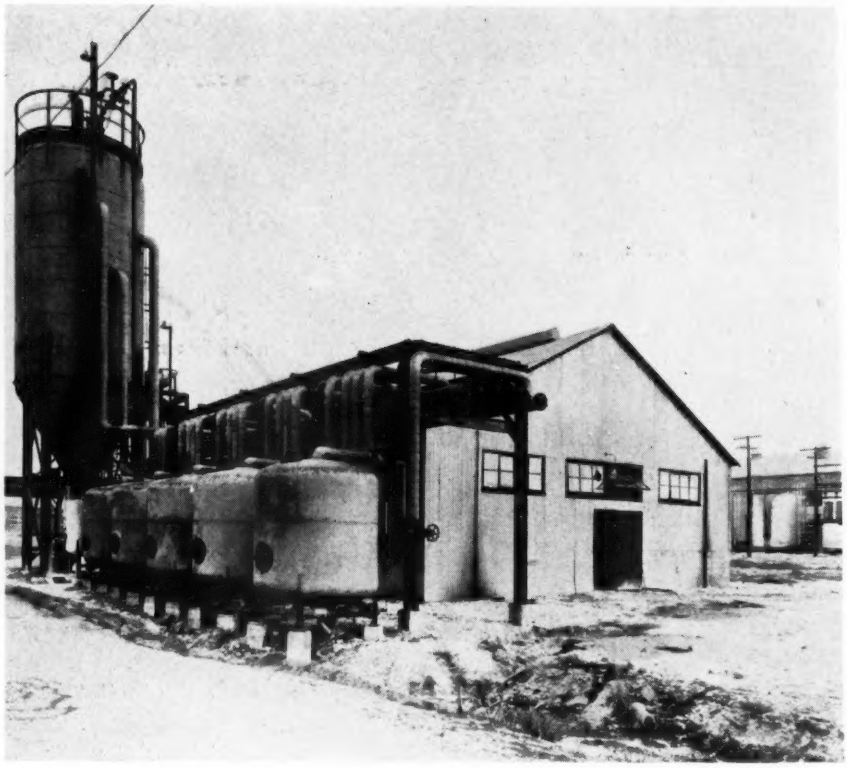

Visitors examine the Center's rubber laboratory, where butyl inner tubes are manufact_red in a small pilot plant. The operator has just removed a completed tube from the curing mold. In the foreground an uncured tube on a forming block is ready for curing.

The Standard Oil Development Co., central research affiliate of Standard Oil Co. (N. J.), has completed the Esso Research Center at Linden, N. J. The center is part of the company's $8,000,000 program for expansion of research facilities. It accommodates 80 separate laboratories, 250 offices, and a library which, it is claimed, contains one of the most complete collections of technical information available in any industry.

Seven hundred and fifty chemists, physicists, engineers and service department personnel will be engaged here. Their work will be closely coordinated with the research and pilot plant work at the other laboratories of the Development company and its associates.

Among the problems currently being studied by this group, and to which the new facilities will contribute, are the conversion of natural gas and coal into liquid fuel, production of higher octane automobile and aviation gasolines, new lubricants, and many projects in the chemical field, including extension of the quality and use of plastics.

Soft to Hard to Soft



Two wells of the new Oakdale, La. plant of Newport Industries, Inc. supply extremely soft boiler water. In the treatment system installed by Hall Laboratories, Pittsburgh, Pa., dolomitic lime removes silica, and gypsum reduces alkalinity (tanks in right background). The water is then filtered, deaerated, mixed with condensate returns, and fed to the boilers. Phosphate softener from dissolving and feeding equipment (center) is pumped directly to boilers to counteract hardness tripled by the treatment. Little sodium sulfite is added (tank at left) as residual dissolved oxygen is low.

Golfers Tie for Governor's Cup

R. J. Spatta (center), Merchants Chemical Co., awards Governor's Cup to E. H. Hattersley (left), Solvay Sales, and P. J. Bertemes (right), Greenwald-Bertemes Co. who tied for low gross at Cincinnati Drug & Chemical Ass'n. final 1948 golf outing.

Metal Coating Via "Gas Plating"

USE OF VOLATILE metal compounds in metal refining is not new. Their use for deposition of metal coatings on surfaces of all types is "gas plating."

THE DEPOSITION of special metal coatings, usually by electrolytic processes, is big business. However, such processes require complex baths, delicate solution balances, and give a relatively slow rate of deposition to obtain a smooth adherent film. Today, "gas plating," under development by the Commonwealth Engineering Co., of Dayton, Ohio (U. S. Patents 2,332,309 and 2,344,138), promises a method that will greatly increase the rate of deposition for those metals which form volatile carbonyls. As used here the term, "gas plating," refers to the deposition of metals on the surface to be plated by the thermal decomposition of volatile metallic compounds in an inert atmosphere.

FIRST, NICKEL REFINING

The use of volatile carbonyls for metal production is not a new story: It dates back to 1890 when Ludwig Mond, experimenting in England, was studying the catalytic effect of finely divided nickel on carbon monoxide. He found that at a temperature of 350-400° F. nickel converted carbon monoxide to carbon dioxide and carbon, the finely divided nickel together with the carbon forming a black amorphous powder mixture.

To prevent the oxidation of the nickel-carbon mixture thus formed, Mond decided to cool the "black substance" in a stream of carbon monoxide. As carbon monoxide is poisonous, the exhaust from the process was burned in the flame of a Bunsen burner. During the combustion of this "black substance" in the stream of exhaust carbon monoxide, Mond noticed an unexpected luminosity of the flame. His conjectures concerning the source of the luminosity suggested he heat the tube through which the gases passed. To his surprise the inside of the tube became coated with a deposit of nickel, the first known case of "gas plating." If the monoxide had been piped to the outside atmosphere, this observation, which led to the well-known process for the separation of nickel from its ore, might not have been made for years.

Continuing his experimentation, Mond later developed the commercial process for the production of metallic nickel—which bears his name—via the formation and subsequent decomposition of nickel carbonyl. This process is still in use in Europe today.

IRON TOO

Metallic iron, in an extremely pure form, is currently being produced by the General Aniline and Film Corp. through the formation and controlled decomposition of iron carbonyl. Powder metallurgy is utilized to fabricate the metallic particles into the various shapes required for their use in electrical equipment.

USES

The primary interest in the foregoing developments was in the production of the metal as a pure material. Today the complete and faithful reproduction of irregular surfaces, internal areas, and complicated structures can be obtained with Commonwealth's process. Another advantage inherent in the process is the ease with which it can be adapted to continuous operation. For example, a roll sheet of fine, hard paper can be run through a gas chamber at a fairly rapid rate with continuous deposition thereupon of a metal film produced by the thermal decomposition of the metal carbonyl. Operation in this manner makes possible either the manufacture of coated sheets or the integrated production of laminates. The fabrication of condenser papers for the electrical industry has been suggested as one important application.

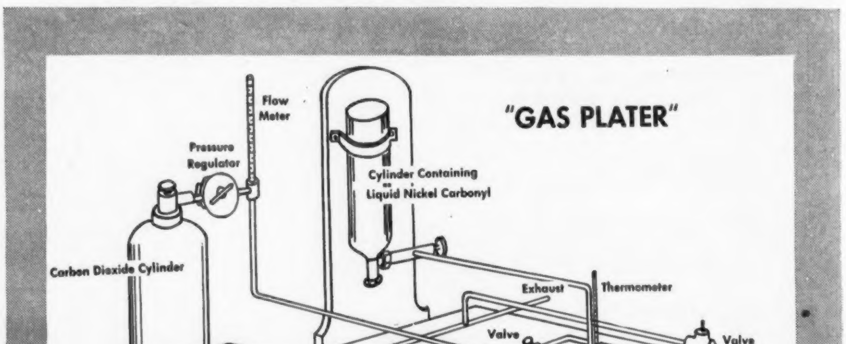
Preliminary experiments in the laboratory have indicated that nickel carbonyl can be thermally decomposed at about 400° F. to produce an integral metallic coating on cores of a non-alloying metal. The metal core could then be melted out to leave a hard metallic shell. This shell, upon reinforcement with sprayed metals, can be used as a base structure for an electrolytic overlay of a more desirable mold-surfacing material, such as chromium.

THE PROCESS

Radiant heat has been found to be the most economical means of carrying out the thermal decomposition. Induction heating has been found to give local areas of over- and under-heating.

The rapid plating rate is exemplified by the deposition of 13 lbs. 6 oz. of nickel in a small table top unit during a single-pass, 60-minute plating cycle. The poisonous characteristics of nickel carbonyl and the control of the temperature are problems. Also, some difficulties were encountered in obtaining plating with good adhesion. Commonwealth notes that this problem has been overcome by desorption of adsorbed gas from the surface to be plated. The other constituent of the "gas plating" atmosphere is carbon dioxide.

Carbonyls of various metals may be used in the process: e. g., nickel, iron, chromium, tungsten and molybdenum. Plated films on copper, iron or lead bases have been prepared and studied extensively. Commonwealth states, moreover, that the process is available for further study on adaptation to commercial operation.



Radiator cleaning usually precedes and follows winterizing.

Automobile Radiator Cleaners

by CORNELIA T. SNELL
Foster D. Snell, Inc., New York, N. Y.

A GOOD GUIDE in formulating cleaners for 40 million car radiators is an understanding of how the chemicals in typical commercial products work.

BY THE END of 1948 an estimated forty million automobiles, trucks, and busses will clog the highways and turn into gasoline stations for a variety of services. At least twice a year—prior to putting in the winter anti-freeze and after draining it the next spring—the attendant will suggest a radiator flush to remove accumulated grease, scale and rust that rob the cooling system of efficiency. The little cans of solids or bottles of liquids that the serviceman uses in the cleaning operation, or that are purchased in auto parts stores, department stores, and the like by home mechanics, represent a variety of chemical formulations designed for a particular cleaning job.

Most packaged anti-freeze mixtures contain corrosion inhibitors along with anti-foam and anti-leak materials. Not all consumers purchase these compounded products, and even when they do, often the advanced age of the car—and there are more old cars operating today than ever before—permits leakage of oil and grease through gaskets into the cooling system literally to gum up the works. Moreover, continuous evaporation of water from the system results in deposition of scale. When no rust inhibitor is present, as is generally the case during summer operation, dissolved air causes considerable corrosion at radiator temperatures. The compounds that remove the cohesive layer thus formed over the inner surface of the radiator are strongly alkaline, strongly acid or neutral, depending upon the material to be removed and the condition of the radiator. The following discussion of examples of commercial or patented products illustrates how and when various types are used.

ALKALINE PRODUCTS

The majority of commercial radiator cleaners, which are satisfactory for most ordinary jobs, are either concentrated solutions of a strongly alkaline salt or the solid form of the salt. In the latter case the user should make a solution before putting the material into the radiator. These very strong alkalies are highly caustic and should be handled carefully so that none is spilled. About a pint of liquid is poured into the radiator which is nearly full of water but not full enough to overflow when the cleaning solution is added. The engine is then run for ten or fifteen minutes to allow the hot solution to circulate and come into intimate contact with the grease and iron rust to be removed.

The cleaning action can be explained by the formation of soap in the soil itself by reaction of traces of fatty acids in the grease with the alkali. Since this soap is formed inside the dirt, it will exert a maximum emulsifying and suspending action on the balance of the greasy soil which may not be saponifiable. The wetting effect of this soap causes it to penetrate to the surface of the metal and so loosen the layer of deposited material. This can then be readily suspended and drawn off by draining the radiator. Finally, plain water should be poured into the radiator, circulated and drawn off to rinse out residual alkalinity.

One of the more expensive of these products is a 72 per cent solution of triethanolamine which is strongly alkaline. More commonly, an alkaline salt is used—for example, sodium metasilicate. This is a much less expensive product and should do an efficient cleaning job. Silicates have some suspending power of their own and, in combination with soap formed by reaction with grease, are especially efficient in suspending particles of rust or undissolved scale. One such commercial product is simply a solution of 20 lbs. of metasilicate in 10 gallons of water. More siliceous silicates are also used, such as sodium silicate having a ratio of $Na_2O:SiO_2$ of 1:2.4, with a specific gravity of 52°Be'. The more siliceous the silicate, the greater is its suspending power, within limits, and the less alkaline its pH. Normally these products in concentrated form will have a pH of about 12.

Because of this high alkalinity there is danger of attack on aluminum, brass or copper parts, although sodium silicate is less corrosive than other alkaline salts at the same pH—that is, it has some inherent corrosion—inhibiting properties. To counteract such undesirable effects of high pH, a corrosion inhibitor is sometimes used as in products having the following formulas:

		%
1.	Sodium silicate solution, 52°Be'.	33.00
	Potassium chromate	0.15
	Water	66.85
2.	Soda ash	35.00
	Sodium dichromate, dihydrate	65.00
3.	Potassium bicarbonate	15.00
	Potassium dichromate	85.00
4.	Trisodium phosphate	12.00
	Sodium chromate	0.30
	Water	87.70

It will be noted that two of these are sold as solutions, two as granular solids. Of these, the bicarbonate powder would be the least effective since this is only very mildly alkaline in solution. Silicate with a fairly high ratio of $Na_2O:SiO_2$ is probably somewhat preferable to trisodium phosphate.

Related to the alkaline cleaners are solutions containing corrosion inhibitors only, which may be added to the water

RADIATOR CLEANERS (continued)—

in the radiator of a new automobile. One such commercial product contains 20 per cent of the dihydrate of sodium dichromate; another contains about 1.5 per cent of sodium chromate, a few per cent of alcohol, and the rest water.

Also alkaline, another cleaner is put up in two packages, the first of which is a liquid containing orthodichlorobenzene and an oil. This material is used first to dissolve grease. The second package contains powdered sodium carbonate monohydrate which is added after the thickest of the grease has been removed by the solvent. This sort of treatment finds application where the deposit on the radiator walls has a high content of grease.

EMULSIONS

A somewhat preferable product—preferable because it is in a single package—is intended to act in the same way. This is an emulsion containing about 22 per cent of light mineral oil, a few per cent of a mixed emulsifying agent and the rest water. The presence of a surface-active agent is twofold: first, to emulsify the mineral oil in water; and second, to wet, emulsify and suspend the particles of oil and dirt to be removed. A mixture of surface-active agents can be expected to accomplish this better than a single agent alone. In the formulation, the mineral oil acts as a solvent for the grease. Such a product can be made up in a neutral or mildly alkaline medium and is probably even more efficient than cleaners which depend on alkalinity alone. A neutral or very mildly alkaline product has the advantage that it can be put in the radiator and left there; immediate drainage is unnecessary and the product will continue to act throughout a whole season. In fact a good formulation of this type can be used in the presence of anti-freeze and radiator stop-leak.

ACID PRODUCTS

As water evaporates from the radiator, a scale of hard water salts is gradually built up, the same as on the inside of a teakettle. If this radiator scale becomes too heavy, it will radically reduce heat exchange and result in overheating of the engine. Such a deposit is composed largely of calcium carbonate, calcium sulfate, and magnesium oxide, with iron rust mixed in. It will be attacked and at least partially dissolved by acid. (Iron rust itself will dissolve in strong acid.) Although organic acids and inorganic acid salts are used here, one patented product is a mixture of 18° Be'. hydrochloric acid and by-product lactic acid. The lactic acid is said to inhibit attack on iron by the hydrochloric acid.

Acid cleaning should not be necessary except under unusual conditions, such as those resulting when large amounts of water have evaporated. As with the strong alkalies, acids are used for only a very short interval and then the hot liquid is drawn off. The treatment should be followed by an alkaline rinse, and this by a plain water rinse.

An example of a commercial product is the following:

		%
5.	Oxalic acid, dihydrate	82.5
	Sodium bisulfate	5.0
	Sodium sulfate	11.5
	Petrolatum	1.0

Another product contains sodium acid sulfate, a surface-active agent such as sodium alkyl aryl sulfonate, and a fraction of a per cent of diammonium phosphate as corrosion inhibitor.

Again as with alkaline salts, these solid mixtures are dissolved in a small amount of water before being put into the radiator. The petrolatum in the first formula may be intended to prevent corrosion by forming a very thin film on the metal surface. It would seem better, however, to omit any grease and to use a straight acid product or the acid with an inhibitor for the first step in the cleaning process.

PROSPECTS

Since 1947, one make of automobile has had a completely closed cooling system which operates under pressure, and others will probably introduce similar designs. Here conditions are unfavorable for accumulation of grease, rust or scale as there should be no leakage of oil into a system under pressure, oxygen is largely excluded, and, ideally, no evaporation takes place. Sludging up of radiators should be less of a problem, although for safe operation, corrosion inhibitors would be advisable.

At present, however, the large number of cars on the road, continually increased by new ones with conventional cooling systems, offers a steady market for radiator cleaners. In time, every radiator must be cleaned. Although simple formulations of standard chemicals do an efficient job, greater attention to problems of surface activity and incorporation of suitable surface-active agents should lead to better products.

SHIPPING EQUIPMENT

(Continued from page 774)

gross weight of 400 pounds. Cost of this package is much less than steel drums of comparable capacity.

PAPER CONTAINERS

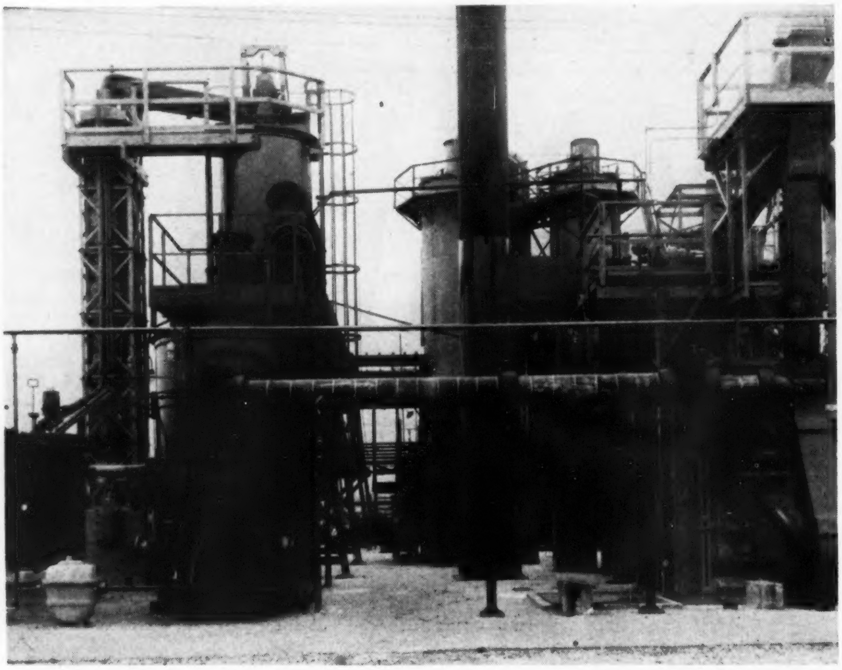
The use of paper bags in the chemical industry was rather limited until after World War I. In the thirty intervening years, demands from the chemical industry for more and better bags made necessary the inauguration and maintenance by the bag manufacturers of a research program. As a result, there are available today paper bags for almost all chemicals that can be packed in this type of container.

BARGE SHIPMENT

Where it is possible, because of the favorable location of both the producer and customer, shipment of chemicals by barge offers the advantage of the most economical form of movement other than by pipe line. Considerable quantities of acids and petroleum products have for years been moved by barges in coastwise, intercoastal, lake and river transportation. In recent years barges have been developed for the transportation of such items as liquid caustic soda and chlorine. Navy and Coast Guard regulations control these movements, but the specifications adopted have been very similar to those involved in rail transportation. In barge movement, chlorine tanks are uninsulated and have a somewhat different piping arrangement for loading and unloading than do the railroad tank cars. Caustic soda barge tanks are practically identical with the latest tank car tanks.

Recently the Coast Guard has specified regulations for the construction of barges for transporting spent sulphuric acid and anhydrous ammonia. Consideration is also being given to specifications for barges for ethyl chloride, carbon tetrachloride, ethylene dichloride, and other liquid solvents. A small container—8,000 pounds maximum—has been approved for water transportation of propane and other liquefied petroleum gases.

There is no industry more alert to the development of improved shipping containers than is the chemical industry. With the objective of increased safety, purity of product, ease of handling, and lower costs guiding research, one can look forward to bigger and better developments in this field.



Sludge acid decomposer plant of the Monsanto Chemical Co. at Torrance, California.

NEW ACID FOR OLD

By Low-Temperature Process

A NEW CONTINUOUS PROCESS for recovering sulfuric acid values from petroleum refinery sludge yields "high-test" sulfur dioxide.

FLEXIBILITY, low temperature decomposition, standardized design, simple operation, cleanliness and high yield are advantages claimed by Monsanto Chemical Co. for the Monsanto-Ross-Wilde process of sludge acid recovery.

The process consists of the deposition of sludge acid in a relatively thin film on coke of 6 to 10 mesh size, and the subsequent heating of the coke to the temperature necessary for the decomposition of the acid.

In operation acid is sprayed or trickled on the coke in an unheated mixer. This mixing outside the heating zone is found to be necessary in order to avoid the formation of "sponge" coke and the subsequent crushing or high temperature required to get the acid out of such coke. After mixing, the coke-acid mixture is passed into a heated decomposer, which to date has consisted of a 24" steel tube having from 16 to 24' of heated length, through which the coke is moved by a plain steel ribbon screw. Other types of equipment are also suitable but full operating data are not yet available.

LOW TEMPERATURE

The maximum coke temperature which is found to be necessary is around 425-450° F. but this applies only to straight alkylation spent acid containing around 90% free sulfuric acid. For normal refinery wastes, which appear to average around 50-60% titratable acidity, a temperature of 350-370° F. is adequate.

Coke discharged from the decomposer is not in the least obnoxious and in normal operation contains from around 1% to 5% free sulfuric acid determined by one-hour extraction with acetone. It is returned by elevator through a controllable feeder to the mixer with the product coke being taken off as surplus from the head of the elevator. This product coke ranges from as low as 4 or 5% of 100% acid decomposed with straight alkylation spent to as high as 50% on acid decomposed with the heavier sludges. It contains up to 9 or 10% total sulfur and is quite free-burning in an over-feed stoker.

Gas from the decomposer ranges from around 60% to as high as 85% SO_2, dry basis, depending largely upon the care taken to exclude air in the operation. Along with the SO_2 there is, of course, water vapor representing the free water content of the sludge and the water formed in the reduction of H_2SO_4 by hydrogen. There are also varying amounts of hydrocarbon gases, depending upon the type of sludge, and small amounts of CO_2 produced in part by reduction of H_2SO_4 by carbon, and in part by combustion of carbon by small amounts of air infiltrating the system.

For operation on lower-strength sludges, gas from the decomposer is ordinarily taken through a small humidifying tower followed by a water-sprayed lead cooler for the removal of condensable hydrocarbons. Hydrocarbon recovery at this point has varied from 5 or 10 to as high as 35 gallons of condensate per ton of 100% H_2SO_4 in the sludge. Condensate varies in color from light straw to a dark brown.

Gas from the lead condenser may be handled in two ways: If it is necessary that all contact plant product be water-white, gas is taken through a combustion chamber for removal of non-condensable hydrocarbons. By holding oxygen in the combustion chamber exit gases down to 3% or less, an SO_2 content of around 30%, dry basis, can be obtained. Following the combustion chamber, the usual cold gas contact plant purification equipment is required ahead of the converter system.

If, on the other hand, some dark acid can be used, gas leaving the condenser can be dried and scrubbed in 98% acid for the removal of unsaturated hydrocarbons. A small amount of saturated hydrocarbons appears to cause no particular trouble in the converter system. It is, of course, necessary that the gases be diluted with air before going to the converter.

Fuel consumption per ton of 100% acid and unit capacity in terms of 100% acid vary with the titratable acidity and with the free water in the sludge to be decomposed. Ordinarily one "double unit" is considered as having a capacity of the order of 20 tons of 100% acid per day but this may vary from as low as 15 to as high as 30 tons. A double unit consists of two tubes mounted side by side in the same furnace and arranged for parallel flow of coke. Fuel consumption is of the general order of 3,000,000 BTU's per ton of 100% acid but as with unit capacity this figure will vary with the type of feed. Monsanto has operated its full scale pilot plant referred to above for a considerable period using the product coke as a fuel. When handled through an "Iron Fireman" over-feed stoker such heating was quite successful. In general, the lower the free water in feed acid the better. Optimum strength of feed acid is represented by an acid/hydrocarbon ratio giving slightly more than enough hydrocarbon to provide complete reduction by hydrogen. Ordinarily this means a feed acid between 75 and 80% titratable acidity.

Monsanto will supply design for a plant of any given size and to guarantee its capacity with any given type of sludge.

NEW PRODUCTS & PROCESSES

Glycols NP 786

Butanediol-1,3 (butylene glycol) and octylene glycol, two new dihydroxy compounds, are now offered in commercial quantities by Carbide and Carbon Chemicals Corp. Both of these new glycols are available in carload drum quantities at 34.5 cents per pound, f. o. b. South Charleston, W. Va.

The hygroscopicity of butanediol is approximately 60 per cent that of glycerol. This, plus its solubility characteristics, makes it valuable for use as a humectant and mutual solvent in inks, adhesives, textile compounds, printing pastes and paper coatings. It is an important intermediate for use in the synthesis of new plasticizers and new alkyd resin compositions.

Octylene glycol is also a 1,3-diol of limited water solubility. As an intermediate, it is of particular value for the manufacture of plasticizers, resins, and glycol derivatives with improved water resistance. It is a plasticizer for certain polyamide resins and a useful coupling or blending agent for metal cutting, leather, and textile oils.

Terpene Alcohol NP 787

Nopol, $C_{11}H_{17}OH$, a new bicyclic primary alcohol produced by condensation of beta-pinene and formaldehyde, is being offered in drum quantities by The Glidden Company, Naval Stores Division, from pilot plant production.

Nopol may be considered methylol pinene, and there is present in one molecule the reactive pinene and primary hydroxyl groups. It therefore undergoes practically all reactions which have been applied to pinene as well as those applicable to primary alcohols, thereby providing a path to synthesis of a host of novel and potentially useful products.

Beta-pinene from which Nopol is prepared is present to the extent of 30-34 per cent in gum turpentine in the form of its optically pure *levo* isomer. Nopol is also an optically pure *levo* compound; no loss of optical activity is experienced in its preparation.

The purity of Nopol being offered is in the range 97-99 per cent. It boils at 111° at 10 mm. and at about 235°C. at atmospheric pressure. Nopol is insoluble in water, soluble in all the common organic solvents in all proportions. Its density is 0.963 at 25°C.

Polystyrene Materials NP 788

Two new basic types of Styron have been announced by The Dow Chemical Co.

The new materials, known as Styron 637 and Styron 475, are applicable where light stability and toughness of present types of polystyrene were not sufficient.

Styron 475, while basically polystyrene, differs from it in the following characteristics: (1) its elongation at break is approximately 10 times that of regular polystyrene; and (2) its impact strength is three to five times greater.

This new material is designed primarily to fill the gap which exists between rigid, dimensionally-stable polystyrene and the tough cellulosic derivative plastics. For the first time, the outstanding properties of these two well-known types of thermoplastics have been combined into one material.

Styron 637, the other new material, confers greatly added light stability. It increases color permanence four to five times. These two materials are in limited commercial production, Styron 475 in a range of opaque colors, and Styron 637 in crystals and whites. These materials fall in a slightly higher price range than regular Styron. Styron 683, a high heat resistant polystyrene, is now commercially available at no increase in price.

Cellulose Acetate Plastic NP 789

A new flame- and heat-resistant cellulose acetate thermoplastic material has been developed by Celanese Corp. of America.

Called Lumarith XF, this new material bridges the gap between the thermoplastic and thermosetting plastics by combining the flame and heat resistance of the latter with the easy moldability and color range of the former. It has earned the Underwriters' Laboratories approval in such applications as lightning arresters, electric mixers, vacuum cleaners and various switch housings.

The new Celanese plastic will appear for the Christmas trade in toys and decorative items such as tree lights and electric shavers. Its use is also indicated for safety respirators and equipment and it will become an important material for safety goggles.

Hexachlorocyclopentadiene NP 790

The Hooker Electrochemical Co. is now producing pilot-plant quantities of hexachlorocyclopentadiene, or C-56. This new product is a highly reactive chemical and as such should be a very versatile chemical intermediate. The various classes of end products which may be prepared from C-56 include: acids, acid chlorides, acid anhydrides, esters, amides, ketones, diketones, quinones, acetals, nitriles and fluorocarbons. The probable fields for the applications of this new chemical are insecticides, dyes, pharmaceuticals, resins, germicides, and fungicides.

The product is a yellow to amber colored liquid with a pungent odor. It has a molecular weight of 272.79, a boiling point of 236° C, a freezing point of —2°, and a specific gravity of 1.715 at 15.5°C. It has no flash point.

Anesthetic NP 791

A new anesthetic, methyl-*n*-propyl ether, is offered by Stanetal Corp. for technical study and laboratory use. The company is prepared to make it on a large scale, but it cannot be made generally available until elaborate clinical tests are completed. This drug is the best of numerous chemicals tested over a long period of time.

Specifications of the ether are as fol-

lows: Colorless liquid, boiling at 37°C.; sp. gr. at 20°C., 0.738; slightly soluble in water, completely miscible with alcohol and ethyl ether.

Mildew Preventive For Laundries NP 792

A process which will lock an effective mildew-preventing chemical into linens has been perfected by Monsanto Chemical Co.

The new process, a modification of an old method for fireproofing textiles, will treat 300 lbs. of laundry for a few cents. It was developed in cooperation with Morgan Linen Service Co. and can easily be meshed with normal commercial laundry washing procedures.

Basis of the treatment is a concentrated solution of sodium pentachlorophenate, a water-soluble fungicide sold under the trade name Santobrite. The treating bath is prepared by adding eight ounces of an approximately 30 per cent solution of the chemical to about forty gallons of water in a standard wood washer. Clothes to be treated are rinsed in this solution for five minutes.

The action of the souring rinse which follows in most laundering formulas is important. Somewhat similar to the housewife's "bluing," the slight acidity of the souring rinse converts the water-soluble chemical in the fibers into a fixed mildew inhibitor. It will remain in the fabric until re-washed, when the high alkalinity of the initial sudsing operation re-dissolves the chemical.

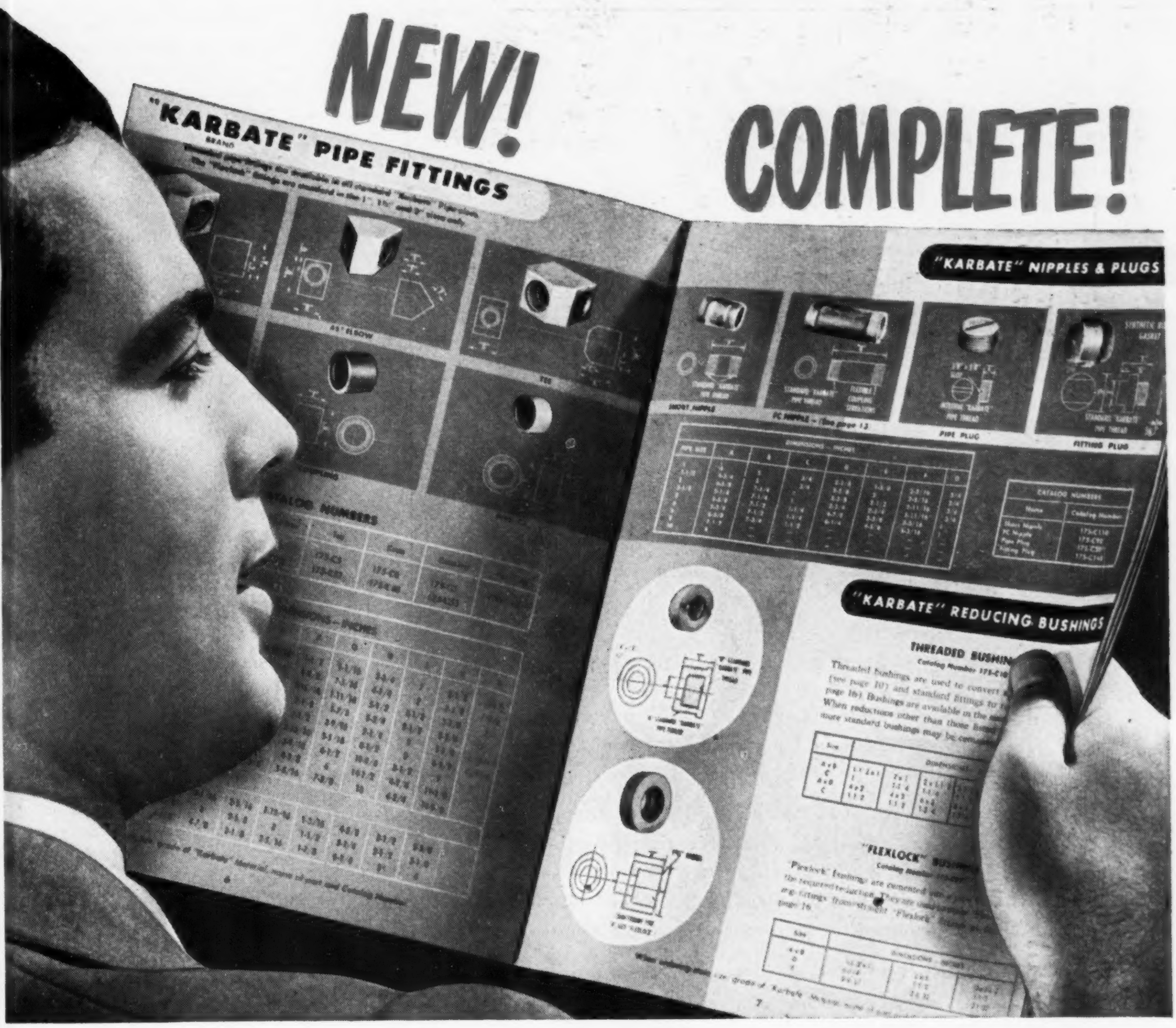
By eliminating the need for a strong bleach solution arising from mildew stains, the life of fabrics is increased as much as 60 per cent. The process may be used for all items, including aprons, white and colored starch work, continuous towel rolls, table linens, napkins and shirts.

Fluorine-Containing Plastic NP 793

Commercial production in limited quantities of Kel-F, an unusually stable, high temperature thermoplastic, has been announced by the M. W. Kellogg Co.

The new plastic is a polymer of trifluorochloroethylene. Four-fifths of its weight is made up of two halogens, fluorine and chlorine. In its natural state, it is colorless and transparent, although it can be blended with solid fillers and coloring agents.

Kel-F is closely related to the interesting new family of organic compounds—the fluorocarbons—which reached practical development during the last war. Because of the absence of hydrogen, the saturated fluorocarbons are characterized by new and unique properties, foremost of which is their extraordinary chemical inertness. Kel-F exhibits the high stability properties of the fluorocarbons combined with an unusual balance of com-



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mercially useful physical properties. For example, although extremely resistant to chemical action, it is easily worked in conventional equipment; although it is strong and hard, it is not brittle; although it can be used at relatively high temperatures, its performance is very satisfactory at extreme low temperatures. It has the uncommon quality of being amenable to heat treatment in a manner similar to the tempering of metals to impart desirable permanent characteristics at the temperature of use.

The new plastic has high stability, low cold flow, usefulness over a wide temperature range, good electrical and heat insulation, unusual water resistance, good fabricating characteristics, and strong mechanical properties.

Talc for Paints NP794

A high-oil-absorption, high-consistency talc for paint manufacture, developed during the war, is now being distributed throughout the Eastern part of the U. S. by Innis, Speiden & Co.

Known as Sierra Fibrene C-400, the talc is cheaper than other competitive low-priced talcs, on a cost basis per gallon of finished paint.

Biochemicals NP795

To offer special help on research problems, Armour and Co. is now offering the following new and potentially useful products:

1. Sterile bovine plasma albumin, 35 per cent solution, for separation of blood elements by adjustment of specific gravity.
2. Bovine hemoglobin enzyme substrate powder, standardized for proteolytic enzyme assay.
3. 1-Monopalmitin, crystallized.

Thermofor Improvement NP796

Houdry Process Corp. has introduced a new low-cost catalytic cracking process called Houdriflow. This new development is an improvement on the Thermofor Catalytic Cracking process which was developed by the Socony-Vacuum Oil Co., Inc., and which has been licensed by Houdry Process Corp. since 1941.

The new design employs a gas-lift principle for raising the catalyst, thereby eliminating the mechanical elevator previously used in the catalyst system. The reactor and kiln are superimposed in the one unit of construction and the regeneration equipment has been simplified and reduced substantially in size, with only one or two zones being required for the regeneration of the catalyst.

Ground area for the construction of the new type TCC is considerably less than that required for the previous design, and

construction cost studies disclose a saving of approximately 20 per cent. Considerable savings in operating costs are also indicated.

Sun Oil Co. has already announced plans to install the improved unit as a major part of its $16,000,000 plant modernization. In addition to the Sun installation, a Houdriflow unit will be installed at the Drumright, Okla., refinery of the Tidewater Associated Oil Co. and the Petco Corp. will install one of the new units at its Blue Island, Ill., refinery.

Styrenated Linseed Oil NP 797

Spencer Kellogg and Sons, Inc., is now manufacturing styrenated linseed oil, a new synthetic process oil for use as a protective coatings vehicle. Styrene was combined successfully last year with soybean oil by the Kellogg Research Laboratories and introduced under the trade name "Keltrol." Further experiments have now resulted in the styrene-linseed combination. The new oil has been used to produce paints and varnishes that dry very rapidly, and can be used to seal porous surfaces without absorption. It produces a harder film than styrenated soybean oil, with high elasticity and resistance to water and alkali. Kellogg styrenated linseed oil has been tradenamed Keltrol "L" and is already available in commercial quantities.

Non-Hazing Alkyd NP 798

Aroplaz 1248-M is a pure, long-oil, oxidizing alkyd resin, supplied at 70 per cent solids in mineral spirits.

The one weakness of architectural alkyds, up to the present time, has been their tendency to develop a "surface haze" in enamels, which has the appearance of a thin film of chalk, resulting in diminished gloss to the point of appearing flat when viewed at normal angles.

Aroplaz 1248-M is the first pure alkyd resin to be offered to the trade which eliminates troublesome hazing in the presence of zinc oxide. In addition to having high sharp initial gloss and excellent gloss retention, this resin meets usual high color retention standards.

Pigment Dispersions For Vinyls NP 799

To meet the requirements of the vinyl plastics industry, a line of specially dispersed colorants and stabilizers in commonly used plasticizers has been developed by the Schiefer-Eldridge Printing Ink Corp. These plastic pigment dispersions offer the advantages of excellent uniformity, extremely fine grind, and ease of handling. A group of tested colorants which have proven themselves in plant and actual use as the best of their type for polyvinyl chloride plastics are now

available in finely dispersed standardized systems at unusually high pigment-vehicle ratios.

Plastic pigment dispersions offer the following advantages to the processor of vinyl plastics: ease of incorporation into the vinyl compound; maximum value and efficiency of colorant or stabilizer; cleanliness—no dusting of dry pigment from one mill to another and general reduction in contamination; smooth even dispersion of color throughout compound with minimum of processing—actually reduces mixing time and compound cost; uniformity; safety; and versatility.

Cleaners NP 800

The Hanson-Van Winkle-Munning Co. has developed a new group of cleaners in addition to the Matawan 45 and 65 series announced several months ago.

Matawan #20-W is a mild non-etching cleaner containing a synthetic wetting agent and a very effective water softener. It is primarily a soak cleaner for aluminum. It will not etch the surface.

Matawan #20-X is a mild non-etching alkaline cleaner containing a cresylic base which aids in the stripping of paint and heavy oil films from aluminum.

Matawan #25 is a non-silicated medium caustic-base especially designed for the etching of aluminum where the presence of a silicate would inhibit the desired etching action.

Matawan #30 is a silicated medium caustic-base cleaner containing no foaming or wetting agent. Its application is principally in spray type washing machines for steel parts where its water softening ability tends to keep the machine and jets free of lime scale.

Matawan #30-W is a silicated medium caustic-base cleaner containing a suitable wetting agent. It can be used on iron, steel, brass, or bronze as a soak or as an electro-cleaner, anodically or cathodically.

Matawan #50-W is a non-silicated high caustic-content type cleaner containing a wetting agent. Its main usage is as a soak solution for the cleaning of magnesium.

Case-Hardening Paste NP 801

A case-hardening paste that does its job without special equipment, and does it far faster than conventional methods, has been developed by Denfis Chemical Laboratories, Inc. A major advantage of this paste, which is called Carburit, is its ready use for selective hardening.

All that is necessary is to cover the section to be hardened with Carburit and heat the work to about 1700 F. A case 0.010 in. thick will form in 5 to 7 minutes and only 25 to 30 minutes are required for a 0.040-in. case. Such a case would require several hours by conventional methods. After heating the Car-

burit in place, the work is cooled and reheated to 1500 F. Then the paste is knocked off and the work is quenched. The hardness produced in various irons and steels compares favorably with that produced by all other known methods.

Because Carburit is applied in paste form it is the ideal method for selective hardening. The paste can be applied to only part of the work, or to the entire surface, as desired. It is easy to apply. When heated it dries out and becomes brittle so that it is easily removed by striking the work before quenching.

Traffic Paint NP 802

A new traffic paint based on two Hercules Power Co. chemicals, Pentalyn 802A resin and Parlon chlorinated rubber, has proved to be outstanding in both durability and rapid dry.

Test cross lines laid down on a highway intersection in South Camden, New Jersey, show little sign of wear after more than two months of service.

Cross lines of a specified formulation in current use by the state were laid down at the same time alongside the Pentalyn 802A-Parlon paint and were almost worn away at the end of the two months. The test lines were applied to both concrete and asphalt surfaces.

Traffic paints based on Parlon and Pentalyn 802A are outstanding both from the standpoint of durability and speed of drying. Drying speeds of these paints vary from 11 minutes to 20 minutes depending on such factors as thickness of film and type of solvent.

Tablets for Ice-Making NP 803

An improved method of tempering raw-water ice utilizes small, convenient tablets. Two or three of them are dropped into the empty ice-making cans before the usual water is added. The remainder of the process is automatic and requires no further attention.

Effective in the making of ice at any temperature, the new tablet gives outstanding results when brime temperatures are lowered for fast ice production.

Tests for over three years indicate practically complete elimination of cracking, better cutting qualities and a more crystal-clear cake throughout its entire area. White butt ends and centers are greatly reduced.

The tablet ingredient, while comparatively new in the artificial ice field, has been long and extensively used in the baking industry and is absolutely chemically pure.

The new tablets are most economical to use; a ton of ice can be treated at a cost of about a penny. Marketed under the trade name, "Improved Ice Tablets," they are manufactured and guaranteed by The Jay & Jay Chemical Laboratories.

Florida Pebble Phosphate
ALL COMMERICAL GRADES
Tennessee Phosphate

Achan Mine

produces special purpose International Phosphate

Larger tonnages of special purpose Florida phosphate have been produced by International since its Achan Mine was brought into production approximately two years ago in order to meet the increasing market demands.

The output of Achan Mine is a coarse pebble phosphate. It is particularly well suited for such special applications as the production of electrothermal phosphorus and of liquid phosphoric acid by wet processes.

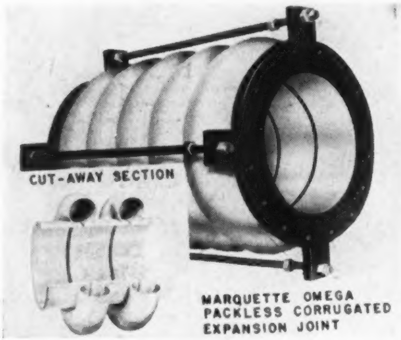
International operates three mines in the center of Florida's richest phosphate field: Achan, Peace Valley and Noralyn with its recently completed facilities for storage, drying and shipping. The output of Peace Valley and Achan Mines is handled through the storage, drying, grinding and shipping plant at Mulberry. At these operations, International has greater production capacity and is producing more phosphate than ever before to meet the urgent needs of world-wide markets.

Phosphate Division, International Minerals & Chemical Corporation International MINERALS CHEMICALS
General Offices: 20 North Wacker Drive, Chicago 6.

NEW EQUIPMENT

Corrugated Expansion Joint QB654

Pipe line movement, axial, lateral, transverse or vibratory, is taken up uniformly by each self-equalizing corrugation of the new Omega expansion joint



of the Marquette Coppersmithing Co. Stresses and fatigue rate are said to be negligible in comparison to conventional designs and much thinner metal can be used for a given pressure. Compression occurs under lower applied thrusts and corrugations can function only within the elastic limit for which they are designed.

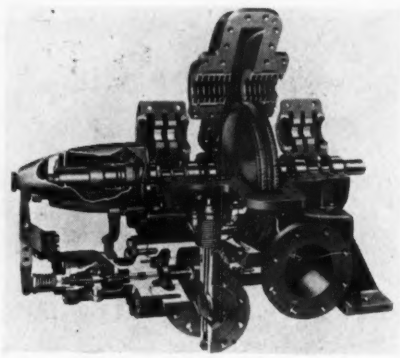
The circular cross-section in Omega design eliminates distortion. Side walls of corrugations need not be depended upon to limit movement and equalizing rings are not necessary. As a result, Omega expansion joints are very light for any specified diameter and pressure.

Omega expansion joints are made with an I.D. from ½" to 25' for any pressure from vacuum to 50,000 psi. Any temperature from sub-zero to over 2000°F. can be accommodated. All ferrous and non-ferrous metals can be used including stainless, Monel, Everdur, nickel and carbon steels. Lead- or silver-lined joints are also available.

Sleeves are seldom required to reduce friction as the inside surface is smooth when the Omega is compressed. No harm can result from fluids or solids lodging in the corrugations but drains or blow-off connections may be easily attached for removing condensate or sediment.

General Purpose Steam Turbine QB655

The new all-weather general purpose turbine for driving industrial pumps, fans, blowers, and compressors, the Typee, of the Westinghouse Electric Corp. provides a choice of three wheel sizes, 16-, 20-, and



25". It permits application over a range of 5- to 1500-horsepower with steam conditions up to 600 psig at 750° F, and speeds of 1000 to 7000 rpm. Equipped with heavy duty parts the turbine will operate at 1500 psig at 950° F. Many parts are interchangeable between wheel sizes.

All-Metal Safety Hose QB656

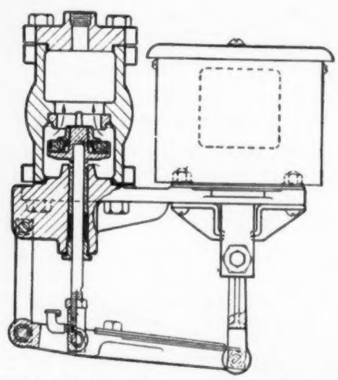
The new copper-clad steel hose of the Pennsylvania Flexible Metallic Tubing Co. has been developed to overcome fire hazards created by sparks in the presence of flammable liquids. This new hose is of full interlocked construction and asbestos packed, made in full accordance with Navy specifications. This unique copper and steel flexible hose is made possible by the use of new strip steel to supply strength and coated with copper which is bonded into the steel. The copper will not peel or cannot be pulled off of the steel hose

The Penflex copper-clad tubing is supplied in all standard sizes and fitted with brass couplings.

Solenoid Valve for Emergency Service QB657

A 150 lb. globe type solenoid valve, specifically designed to meet emergency or safety requirements, has recently been made available by the Johnson Corp. Intended for service in which the valve is normally open, this Series No. 6000 valve is capable of remaining closed for indefinite periods of time.

In an emergency, the control element immediately causes the solenoid to be energized, closing the valve instantly. Since the valve closes with the pressure and flow, it will remain closed as long as a pressure above three pounds exists on



the inlet side, and regardless of whether or not the solenoid continues to be energized.

To permit easy opening of the valve once the emergency has passed, a ⅛" pipe, branching from the main inlet pipe, by-passes the inlet side of the valve and leads directly into the chamber on the outlet side. Flow through this pipe is controlled by a ⅛" globe valve. Opening it equalizes the pressure above and below the disc, thereby allowing the solenoid-controlled valve to open. (It is necessary that there be a shut-off valve in the outlet piping if it is not dead-ended.) The globe valve is then closed and is again ready for operation.

The series No. 6000 valve has a heavy cast body, suitable for pressures up to 150 lbs., and is furnished with Jenkins disc construction to handle steam, hot or cold water, gas, air, gasoline or oil. Available in six sizes, from ¾" to 2½". It may be used on 110, 220, 440 volt, 60 cycle A.C.

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (11-8)

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

QB654	QB659	QB664	QB669	QB674	QB680	LE100
QB655	QB660	QB665	QB670	QB675	QB681	LE101
QB656	QB661	QB666	QB671	QB676	QB682	LE102
QB657	QB662	QB667	QB672	QB677	QB683	LE103
QB658	QB663	QB668	QB673	QB678	QB684	LE104
				QB679	QB685	

Name .... (Position) ....
(Please print)

Company ....

Street ....

City .... (Zone) ...... State ....

Multi-Record Electronic Recorder QB658

The multi-record dynalog electronic recorder of the The Foxboro Co. is a high-speed instrument, completely electronic in principle, making from one to six different records on one circular chart, the records being of colored dots so closely spaced as to make virtually continuous lines. The Recorder has only

one measuring system, either resistance bulb or EMF type, but a positive-acting switching unit automatically brings the vari-colored pens into recording position at 6-second intervals, in any sequence desired. The sequence and number of points may be changed at will. Complete color-coding prevents possible mis-mating of circuits and pens.

An innovation in the design of the recorder is the use of its Rotacolor pen wheel holding the six recording pens, which are magnetically selected in turn and held in recording position by a single pen arm. Excepting for its unique recording mechanism, the recorder conforms to the design and construction which is standard for other Foxboro Dynalog (electronic) instruments; and, like these, the multi-record recorder may be used for measurement of nearly any process variable. A special "dry ink" insures clean recording, and the instrument will operate continuously for several weeks without need of re-inking.

Chamber Gage for Surging Systems QB659

A new large chamber gage is now being offered by Jerguson Gage & Valve Co. for use in gaging liquids that boil, where the liquid fluctuates rapidly in the glass.

Ordinary gages, it is stated, cannot give sufficiently accurate readings when boiling and surging action is present. However, the gage chamber has been built to such large diameter that the effect of the boiling action and liquid level fluctuation is minimized.

The gage is indicated for use on light end services and as a visual standpipe. The Jerguson large chamber gage is of the flat glass, reflex type, and is made in sections up to any desired length, in multiples of the standard Jerguson No. 7 reflex glasses.

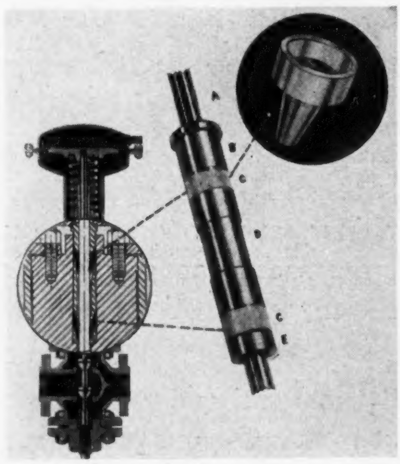
Heat Exchanger Cleaner QB660

For fast and thorough cleaning of heat exchanger bundles, cooling coils and most other types of processing equipment, the Sellers Injector Corp. has introduced a new portable Hi-Pressure jet cleaner. This new cleaning machine removes process residues, dirt, oily sludges and similar matter.

Portable and simply operated, the cleaner has a self-contained 50-gal. tank for a detergent, a 50 ft. pressure-type hose and nozzle with operating controls for various cleaning jobs. Only connections to a steam and a water line are required. There are no moving parts. High pressure and high temperature water shoots from the nozzle and, if desired, the jet is uniformly mixed with the desired amount of detergent. Jet pressure is adjustable up to approximately double the initial steam pressure. Both temperature and amount of detergent are also adjustable.

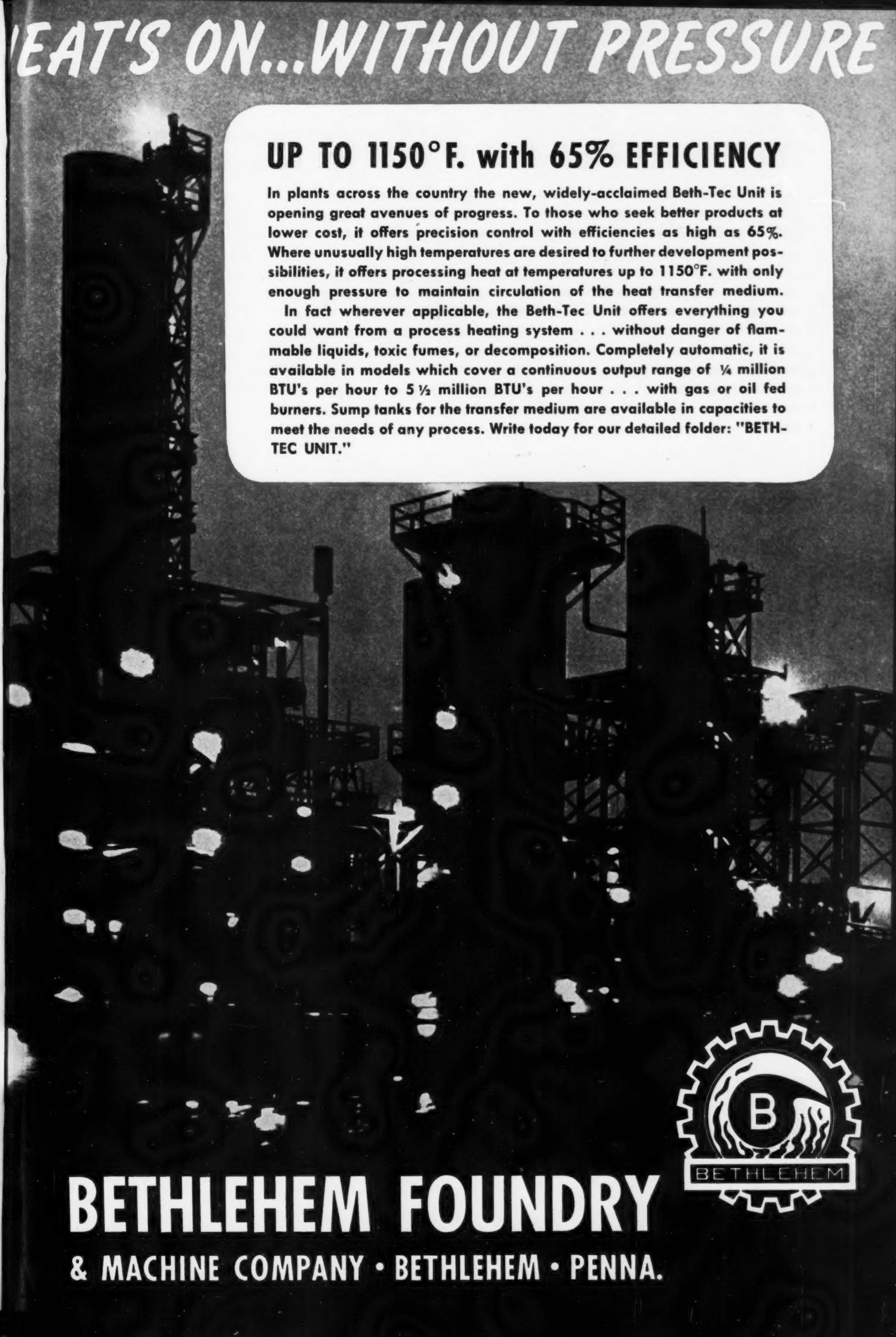
Leak-Proof Valve Stem QB661

The "Dahl-Seal" (pat. pend.) of The Hammel-Dahl Co. provides a frictionless, leak-proof valve stem, regardless of the static pressure on the valve body. It is a scientifically shaped inert plastic seal, providing a frictionless, leak-proof valve stem on a control valve regardless of system pressure. The control valve stem is hermetically sealed by the force of the system pressure due to the special shape of the "Dahl-Seal." It eliminates and



replaces the conventional packing box. No take-up or adjustment is necessary as it is inherently lubricated and is completely resistant to chemical attack. The valve stem can be positioned to an accuracy of 0.001" at full vacuum, atmospheric to 25,000 psi gauge.

The attached sketch illustrates how the


EAT'S ON...WITHOUT PRESSURE
UP TO 1150°F. with 65% EFFICIENCY
In plants across the country the new, widely-acclaimed Beth-Tec Unit is opening great avenues of progress. To those who seek better products at lower cost, it offers precision control with efficiencies as high as 65%. Where unusually high temperatures are desired to further development possibilities, it offers processing heat at temperatures up to 1150°F. with only enough pressure to maintain circulation of the heat transfer medium.
In fact wherever applicable, the Beth-Tec Unit offers everything you could want from a process heating system . . . without danger of flammable liquids, toxic fumes, or decomposition. Completely automatic, it is available in models which cover a continuous output range of ¼ million BTU's per hour to 5 ½ million BTU's per hour . . . with gas or oil fed burners. Sump tanks for the transfer medium are available in capacities to meet the needs of any process. Write today for our detailed folder: "BETH-TEC UNIT."
B
BETHLEHEM
BETHLEHEM FOUNDRY
& MACHINE COMPANY • BETHLEHEM • PENNA.

"Dahl-Seal" is installed in a diaphragm control valve. The component parts are as follows:

(a) Super finished plug stem
(b) Gland follower
(c) Dahl-Seal
(d) Gland
(c) Dahl-Seal
(e) Lower gland

The gland follower gland and lower gland clamp the "Dahl-Seal" firmly in place, the lower lip is completely unsupported and subject only to the system pressure. System pressure on this lip seals the super finished valve stem. Once adjusted at the factory, no further field adjustment is necessary. To date, with over two years continuous use in various field tests at pressures up to 8500 psi, there has been no replacement or failure of a single "Dahl-Seal." Tests for a shorter period at 15,000 psi to 25,000 psi indicate the same result.

Globe & Angle Valves QB662

Highlight of the new bronze globe and angle valves now offered by The Fairbanks Co. is the interchangeability of the disc-and-seat combinations for full portway (2 types) and throttle portway use.

The three types include either heat-treated stainless steel plug discs and seats or nickel alloy radial discs and seats, while all three are constructed with back-seated rings having a pressure-tight joint between seat ring threads and line pressure. In the body, ribs support stressed areas. In the stem, the special alloy has increased resistance to corrosion, abrasion and distortion.

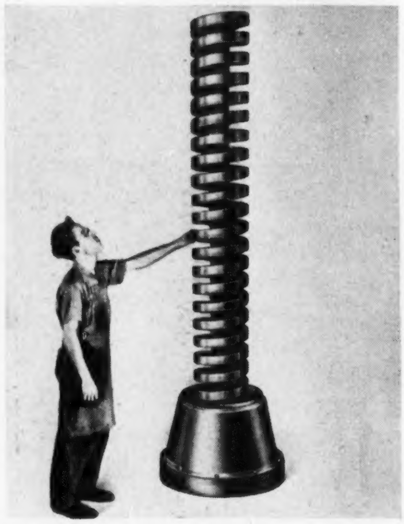
For regular service, the nickel alloy radial disc and seat is available for service up to 300 psi where throttling is not required but pressures and operating conditions tend to shorten valve life.

For severe operating conditions where some throttling is required the full-port stainless steel plug disc and seat is suggested as it has a longer contact area.

For the most severe service the throttle-port stainless steel cone-plug disc is recommended, where constant throttling is required. This construction allows 75% of full flow. Disc and seat contact is double that of the full-port type.

• QB663 Silicone resins for winding insulation and silicone grease for bearing lubrication make possible the *totally-enclosed non-ventilated motor* of the Westinghouse Electric Corp. in a 5-hp 4-pole rating in the same frame sizes as the open motor of the same rating. This permits reductions of as much as three frame sizes from present standard Class A insulated totally-enclosed motors. The efficiency, power factor and torque of such a motor are comparable to those for an open motor of the same rating.

• QB664 A new way of elevating or lowering bulk materials is by application of Syntron controlled vibration to a spiral elevating ramp. Highspeed vibration alone causes the material to flow up and around



the ramp at rates controllable by a rheostat or reactor provided with each unit.

These feeders are available in limited heights and diameters. The maximum tonnage required determines the diameter of the spiral ramp and it is available for operation from 110, 220 or 440 volt A.C.

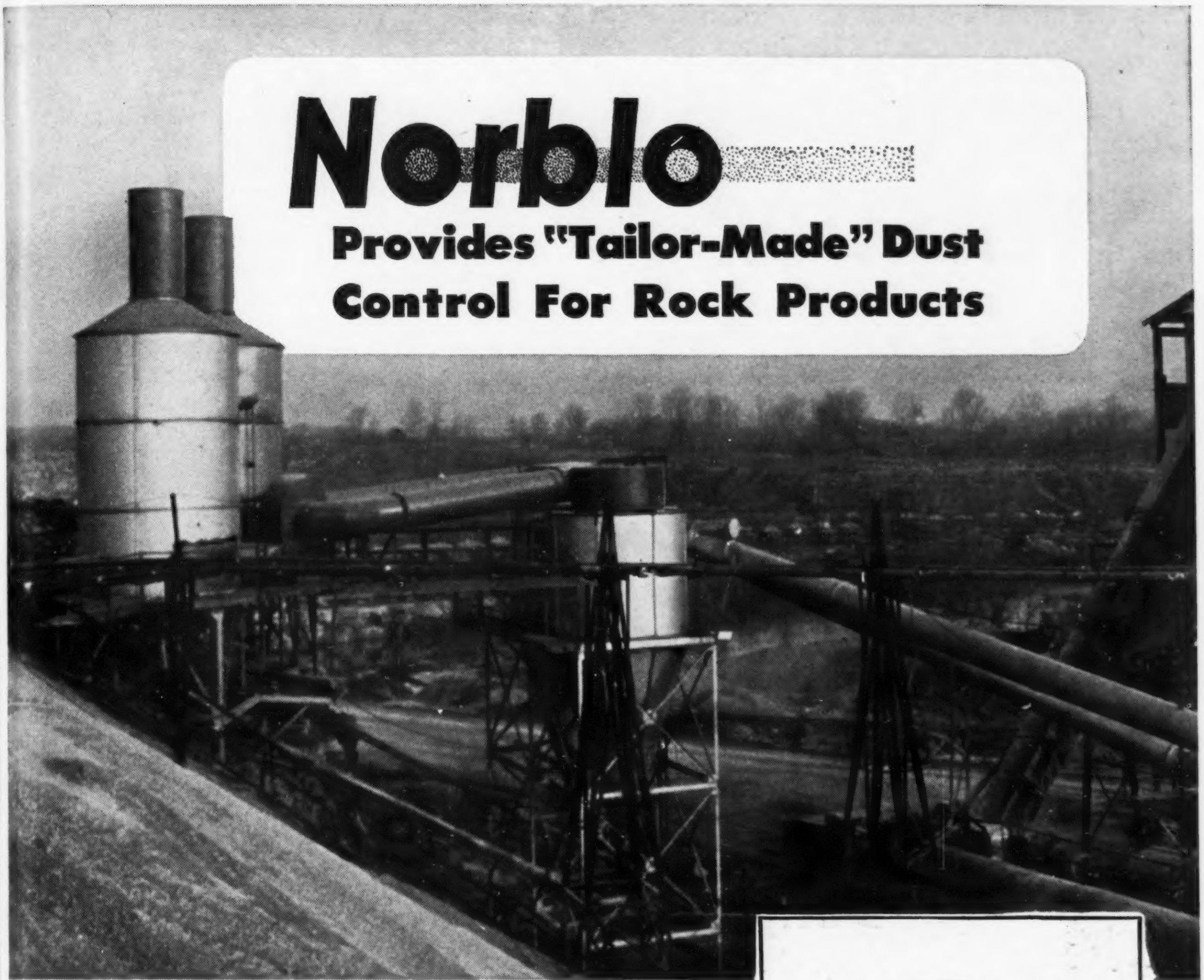
• QB665 To meet the need of a ***high amperage rectifier*** for laboratory use the W. Green Electric Co. offers the "Multi-Rectifier" type of power supply. These units incorporate six selenium rectifier sections which may be quickly interconnected to provide a choice of four D. C. ranges:

0-8 volts, capacity 100 amperes
0-16 volts, capacity 50 amperes
0-24 volts, capacity 35 amperes
0-48 volts, capacity 18 amperes

At any voltage and current the output has a ripple content of only about 5%. The units operate on 220 or 440 volt 3-phase AC.

• QB666 Raytheon Mfg. Co. has added a new model to its VR-6000 *voltage stabilizer* line. It is a hermetically-sealed, oil-filled, frequency-compensating model of 15 watts rating, for an input frequency range of 57 to 63 cycles, input voltage of 95 to 125 volts and output of 115 volts stabilized to $\pm 1\%$ for both line and frequency regulation.

• QB667 Allis-Chalmers has introduced a new line of tube-type, totally-enclosed, fan-cooled, *squirrel-cage motors* ranging from 150 to 600 hp. The use of tubular type heat transfers follows, in general,



EFFICIENT and economical dust or fume control in the crushed stone and cement fields has long been a Norblo specialty. To meet the increasingly stringent code requirements covering these and similar industries, Norblo engineers and fabricators provide centrifugal, hydraulic and bag type collectors. These three types properly combined meet completely the requirements of all the rock products, phosphate, talc and similar mining and processing, fume separation in zinc and lead smelting, etc.

Write for bulletins — or tell us your problem — no obligation.

Save time and errors in figuring pipe diameter, static loss, etc., in dust collecting, air conditioning, or ventilating problems. Write on your business letterhead for your Norblo Airflow Calculator — a handy and useful device for engineers. Free — no obligation — but address Dept. N-2 please.

The Northern Blower Company

Automatic and Standard Bag Type Fume and Dust Collectors, Norblo Centrifugal and Hydraulic Collectors, Exhaust Fans

6418 Barberton Avenue • Cleveland 2, Ohio

the methods employed in previous motors of larger size built by Allis-Chalmers.

Internally, the new motor is divided into two isolated parts with each side having its own path of internal air circulation. The new line is being offered with Underwriters' labels for 1-D or 2-G locations in ratings of 3600-rpm, 250 to 400-hp., 1800-rpm, 200 to 300-hp., and 1200-rpm, 150 to 200-hp.

• QB668 An entirely new type of *fire truck* is being manufactured by the Fire Extinguisher Div., Ansul Chemical Co. This fire truck, the first to use dry chemical as the primary extinguishing agent, provides maximum protection for airports, oil refineries, chemical plants and other installations where severe flammable liquid fire hazards exist. 2800 lb. of dry chemical and 250 gal. of water are carried on the truck. Fully loaded, the vehicle weighs 21,500 lb.

Ansul's new fire truck has four wheel drive, five forward speeds and one reverse. Four extra compartments on the sides of the truck house accessory fire and rescue equipment.

• QB669 A new portable *oven-temperature tester* for checking the performance and efficiency of heating units is being marketed by General Electric's Meter and Instrument Divisions.

The instrument, Type DO-50, is a sensitive d-c millivoltmeter calibrated for use with iron copnic (constantan) thermocouples having a resistance of 2.0 ohms. It was developed to obtain quick, accurate readings when checking new installation performance or the efficiency of ovens, control processing or heating equipment, and other appliances.

The new tester consists of a 3½" panel instrument mounted in a small leatherette-covered case with a compartment for storing the thermocouple assembly and leads. With a scale range from 0-650° F, the instrument has an accuracy of ±5% of full-scale value.

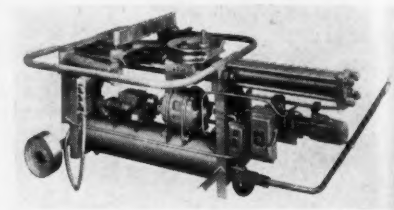
• QB670 For use with DC motors having permanent magnetic fields, the RL 141 of the Motor Speed Corp., offers *speed control* over the range from 0 to 125% of rated speed. The speed/torque curves obtained are essentially flat from 0-150% of rated torque.

• QB671 Tight shut-off despite corrosion or deposits on the valve parts is incorporated into the new *valve* of the Sellers Injector Corp. Other features in-

clude a self-cleaning action, multiple seat design, and injection sealing for emergency conditions. Available in ½" to 10" sizes with choice of standard flange connections.

• QB672 The Wallace Supplies Mfg. Co. has introduced the first self-contained, portable, hydraulic, ram type *pipe bending machine,* the No. 1402.

It is an entirely different and simplified method of ram bending. No reposition-



ing of the dies or relocating of the material is required when bending up to 180° in one continuous operation. A simple initial setting of the duplicator stop will make an unlimited number of the same bends if desired. The special design and construction gives a virtually clear "table top" space in which to handle the material being bent.

Equipped with standard die equipment for bending up to 2" extra heavy weight steel pipe, it will bend coils, return bends, special curves. Dies available for angle iron, channels, reinforcing bars, flat bars, etc.

• QB673 Wagner Electric Corp. is now building *totally enclosed fan-cooled motors* in the 736 frame size, in ratings of 200 hp at speeds of 3500, 1750, 1160 or 870 rpm, 550 volts or less, and 150 hp at the same speeds for operation on 2300 volts. These motors are approved by the Underwriter's Laboratories for Class I Group D and Class II Groups E, F and G hazardous locations.

• QB674 The first *foam-type recharge,* National "99," ever produced for hand extinguishers suitable for fighting alcohol and other polar organic fires has been developed in the research laboratories of National Foam System, Inc. It may be used in any 2½ gal. foam extinguisher marketed. This new foam recharge also is effective in extinguishing petroleum product fires.

• QB675 The new *turbine type pump* of the Roy E. Roth Co. is suitable for pressures up to 80 lbs., speeds up to 2200 rpm, capacities up to 8 gpm. It is all bronze with a stainless steel shaft and double ball bearings. The single multi-vaned impeller, which is the only moving part of this pump, develops high pressures in single stage construction, and will handle condensate without vapor binding. The pump is available with or without motor, base, and coupling.

• QB676 The new line of *sanitary stainless steel pumps* of the Waterous Co.

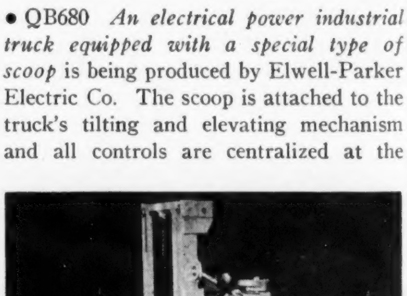
is designed to eliminate all internal threads. The pumps are of rigid ball bearing construction with positive tolerance control, and can easily and quickly be disassembled for cleaning as they have a minimum of removable parts.

• QB677 The Foote Bros. new line of *closed worm gear drives,* in both horizontal and vertical types, are smaller in size than conventional drives of equal capacity. They permit the use of a smaller, less expensive reducer because of increased thermal capacity due to the immersion in the oil reservoir of an air channel cylinder through which passes a high velocity stream of cool air.

• QB678 For protective insulation in conduit installation and for compactly sheathing a series of wires, a new *lightweight tubing* has been developed by Extruders, Inc. Made of Vinylite compounds, Insulite tubing has applications for consolidating an aggregate of wires within a compact package, and is suggested for transmission of corrosive and other fluids and gases. In addition to the natural clear color, it is available in black, white, blue, green, red and yellow.

• QB679 A new three-way *air meter* weighing 11 lbs. which gives air velocity, air temperature and static pressure readings at the turn of a knob, is marketed by the Anemostat Corp. of America. The meter measures air velocity from 10 fpm to 5000 fpm and provides rapid-response measurement of temperatures from 30° F. to 155° F. Either negative or positive static pressure may be read directly in inches of water, from .05 to 10 positive and .05 to 4 negative.

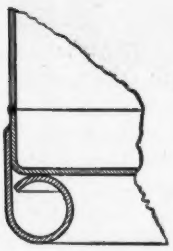
• QB680 *An electrical power industrial truck equipped with a special type of scoop* is being produced by Elwell-Parker Electric Co. The scoop is attached to the truck's tilting and elevating mechanism and all controls are centralized at the



driver's station. A simple tripping device on the scoop provides for rapid discharge of the load. It also has a pneumatic snubber to cushion impacts. When the scoop is lowered to floor level it assumes its normal shoveling position. Providing for ready adjustment to local conditions, the truck's upright column may be tilted forward 5° from perpendicular. For safe carrying of the load and to avoid spillage, the upright column may be tilted

Hackney DRUMS

NOW... of Long-Lasting Stainless Steel



The special, formed Hackney welded chime construction provides a smooth bottom which may be easily and positively cleaned. Thus, its advantages of cleaning and sanitation are important for the shipment of many chemicals and foods.

These Hackney Straight Side Drums are masterpieces in attractive stainless steel—that stable metal so justly famous for its long life and resistance to corrosion. Exceptional light weight and adequate strength, too, are features of this new container. In design and construction, Hackney Stainless Steel Drums are everything a shipper could desire.

The head is completely removable—making emptying and cleaning exceedingly easy. Your choice of two closures—the famous quick-acting Toggle-tite and a bolt-type closure. Interiors are crack- and crevice-free—there is no place for foreign matter to lodge.

Hackney Stainless Steel Drums are absolutely liquid-tight — no chance for leakage, in or out. They are returnable containers, promising the shipper many years of low-cost service. *Write for full details.*

Hackney Removable Head Seamless Aluminum Bilged Barrels

Aluminum, by its very nature, is friendly to food. That's why these Hackney Barrels are such ideal containers for these and other types of products. Design and manufacture make this barrel a lightweight, sturdy, economical container.

Hackney Drums and Barrels also in mild steel.

Pressed Steel Tank Company

Manufacturers of Hackney Products

Main Office and Plant: 1499 South 66th Street, Milwaukee 14

1306 Vanderbilt Concourse Bldg., New York 17 — **208 S. La Salle St., Room 2073, Chicago 4**

209 Hanna Bldg., Cleveland 15 — **556 Roosevelt Bldg., Los Angeles 14**

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

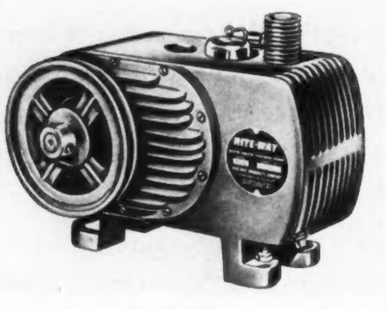
forward 4° from perpendicular. For safe carrying of the load and to avoid spillage, the upright column may be tilted backward 15° from perpendicular. Flexibility of the machine facilitates loading or emptying the scoop at floor levels or at any height up to 117".

Capacity area of the scoop is 12 cubic feet; capacity weight of load is 2000 pounds. Speed of the truck with load ranges up to 5½ miles an hour.

• QB681 A new standard line of *insulated baskets* for dipping, pickling and general use in submerging parts or products in corrosive solutions of the Automotive Rubber Co. is fabricated of heavy gauge, reinforced, perforated steel with welded joints, completely covered with ⅛" thick, shock-proof, semi-hard pure rubber. Perforations are ⅛", ¼", ½" and ¾".

Four sizes of baskets are offered in each hole size: 12" diameter by 12" depth, 10" by 10", 8" by 8", and 6" by 6". Rigid bails, welded to the body, are also completely rubber covered. Special sizes and shapes will be made to specifications.

• QB682 An improved *rotating plunger type vacuum pump* for general industrial use is now being produced by Rite-Way Products Co. Compact and streamlined, this new unit develops 28½" of vacuum on a blank test. With 15" of vacuum and speed of 1700 rpm, the pump capacity is rated at 4½ cubic feet of free air per

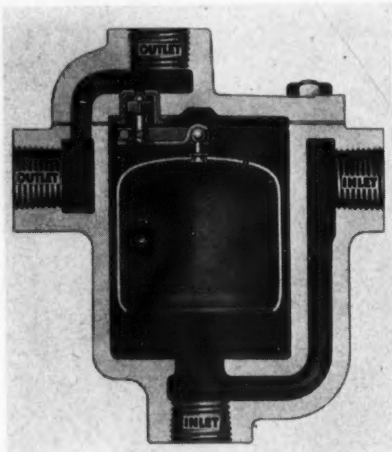


minute. The unit features a built-in muffler and a new, sealed-in lubricating system. The rotor is eccentrically mounted on a shaft rotating counterclockwise within the cylinder bore. There is no lost stroke; intake air mixes with oil which flows through the pump, lubricating all parts and sealing clearances. Oil vapor is condensed in muffler chamber and returns to exhaust chamber where it is sucked up by oil line and recirculated.

• QB683 The new unit for continuous *sampling of low-pressure steam* of Industrial Instruments, consists of a copper coil within a copper shell. The sample cooler, rated to condense and cool 125 psi saturated steam, runs the cooled sample through a throttling valve, past a thermometer and then through a small flow type conductivity cell, and to waste. A wide variety of solu-bridges and solu-bridge recorders for steam purity measurements are adapted for use with the unit. Steam sample inlet and cooling water connections are respectively ⅛" and ⅜" I.P.S. Overall dimensions are 18" x 4½".

• QB684 The Clark Mfg. Co., has introduced a new small, versatile low cost *steam trap*.

Known as the Clark "60", it is furnished with various size seat orifices for work-



ing pressures up to 150 psi and temperatures up to 375° F. This small inverted bucket type steam trap embodies such big trap features as a positive-seating guided disc which is free-swinging, self-aligning and operates with minimum friction. The disc always remains centered with seat opening.

A simplified piping arrangement features a choice of horizontal or vertical connections at either inlet or outlet or a combination of both. This makes the new "60" easily adaptable to many uses with a minimum of pipe rearrangement.

• QB685 Redesign of many features of *rotary vacuum dryers*, manufactured by the F. J. Stokes Machine Company has materially increased the operating efficiency of these units; now available in nine standard sizes from 1-600 cubic feet working capacity. Maximum mixing action of the material, and essentially complete discharge when the operating cycle is finished, is assured through the redesigned spiral type agitators. In addition, maximum contact of material with the heating surface of the shell is accomplished by the new construction of the agitator blades.

An exclusive feature, heating both shaft and agitator arms, improves performance and provides up to 30% more heating surface. This feature is now standard on Stokes models of 50 cubic feet working capacity or larger; can be furnished on smaller models.

LABORATORY EQUIPMENT

Proportional Counter LE100

The Model 117 alpha proportional counter system of Instrument Development Labs. was designed to count alpha particles in the presence of a strong beta activity. The unit consists of (1) a methane flow proportional counter with sample holder, (2) a built in variable high gain linear amplifier, (3) scale of 256 to 1, (4) built in high speed impulse recorder, and (5) variable high voltage supply.

The methane counter chamber has a very highly polished cylindrical cathode. The anode is .002" tungsten wire mounted between glass insulators. To clean the chamber, the bottom plate is removed, exposing the cathode surface and center wire. The sample holder is for standard 1" diameter samples with provision to raise the sample up into the counting volume for improved geometry.

A two tube high gain linear amplifier with a flat frequency response between ten thousand cycles and two megacycles has variable gain. The gain is controlled and set on the panel dial. It can be set so that pulses from the counter exceeding any desired amplitude between two millivolts and twenty millivolts will trip the scaler. This allows discrimination between the pulses caused by beta particles and those of an alpha particle.

The scaling circuit is of the binary type Higinbotham scaler, and is employed chiefly because of its reliability. There are eight scaling stages giving a scaling ration of 256 to 1.

Electronic Analog Computer LE101

An office size electronic computer, capable of solving intricate industrial process and research problems, is available commercially. Called the REAC (Reeves Electronic Analog Computer) by its designers, it was developed by the Reeves Instr. Corp. for the Special Devices Center, Office of Naval Research.

The standard REAC is suited to the chemical and process industries as a high-speed computer, as a simulator, or as a tester.

As a computer it will provide accurate dynamic solutions of simultaneous differential equations in a small fraction of the time required by mechanical differential analyzers.

As a simulator it may be used to design automatic control equipment for continuous processes. The REAC may

(*Continued on page 893*)

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Materials Handling Show To Stress Efficiency

The Third National Materials Handling Show, jointly sponsored by the management and materials handling divisions of the American Society of Mechanical Engineers and the Material Handling Institute, will be held at Convention Hall, Philadelphia, January 10-14. Concurrent with the exposition, the A. S. M. E. groups will conduct a five-day Conference on Materials Handling. Emphasis in both exhibits and conference talks will be placed on the need for greater efficiency in handling to reduce production and distribution costs, and the greater use of existing facilities for storage. Various systems of handling materials in production and shipment will come under discussion, and a Materials Handling Theater will exhibit late films on handling subjects.

The show will be one of the five largest annual industrial expositions to be held in this country. One hundred and ninety-two companies have already leased exhibit space, and more are expected to do so before the opening date. Admission to both the exhibits and conference will be by registration, and no charge will be made. Last year more than 15,000 executives registered at the Cleveland show.

Among the many types of equipment to be exhibited will be hand trucks, lift trucks, conveyors, hoists, monorails, portable elevators, stacking units, cranes, tractors, trailers, fork trucks, skids and pallets, and their respective accessories.

Advance registration cards may be obtained from Clapp and Poliak, Inc., 350 Fifth Ave., New York 1, N. Y. Hotel reservations may be obtained through the secretary, housing bureau, Materials Handling Show, 17th and Sansom, Philadelphia 3, Pa.

In highlighting the importance of the exposition to industry, S. W. Gibb, general sales manager, Philadelphia division, Yale and Towne Manufacturing Co., and president, Material Handling Institute, said, "Low cost movement of materials and more extensive use of existing facilities has become, in recent years, one of management's key problems. Efficiency in handling is the key to lowered operating costs. Equally urgent is the utilization of the full height and width of plant facilities for lowered overhead costs. We must bear in mind that the military training program will require many of the young men who normally would be employed in handling tasks.

"Probably the best evidence of this ever increasing interest of top management in materials handling is the growth of the Materials Handling Show which, in two years, has now become one of the largest annual industrial expositions in the country," Mr. Gibb continued.

"One-quarter of every dollar of industry's payroll is spent for handling. In some industries, the cost runs up to as much as fifty per cent. Yet handling adds nothing to a product except cost. Unused cubic footage in plants represents another loss.

"Here is an economic waste of billions of dollars annually which efficient handling techniques can eliminate. To the consumer, lowered costs for handling mean a halt in the rising cost of living. To industry, lowered operating costs plus greater use of existing capital assets, mean greater profit," Mr. Gibb declared.

Serving as co-chairmen of the technical program committee for the A. S. M. E. are Curtis H. Barker, Jr., vice-president, Pallet Sales Co., and national chairman of the materials handling division, and Prof. W. R. Mullee, department of administrative engineering, New York University, New York, and national chairman of the A. S. M. E.'s management division.

Dravo Building Fleet of HCl Barges

Now under construction at the Dravo Corp. Shipyard, Pittsburgh, Pa., is a fleet of five hydrochloric acid barges for the Dow Chemical Co., Texas Division, Freeport, Texas. The first barge is scheduled to be delivered soon.

Each of the specially-designed barges will contain four 58,400-gallon tanks—rubber-lined to render them impervious to the acid. They are the first inland river barges to be designed exclusively for this service.

Disposable Liner Eases Drum Problems

Cincinnati Industries Inc. has developed a disposable drum liner for use in open-head, returnable steel drums. When development of this liner, described as a disposable X-Crepe drum liner, was started, two direct savings for shippers were contemplated:

(1) The cost of cleaning drums, and (2) the cost of coating drums subsequent to cleaning.

When X-Crepe drum liners were completed and put into actual use, however, it was found that several important corollary savings are obtained in addition

Materials Stored on Pallets Until Processed

In a Quonset-hut warehouse at the Tuckahoe, N. Y. plant of Burroughs Wellcome & Co., Inc., palletized unit loads of starch tiered four-high by fork truck are stored until needed on processing lines.

to the original two: (3) invaluable time is saved, because drums are reusable immediately upon being emptied; (4) since no drums are out of circulation for cleaning and coating, drum inventory investment is reduced to the minimum requirements of actual shipping needs; (5) less handling, and elimination of caustic cleaning compounds prolongs drum life; and (6) higher resale value is realized when drums are finally sold.

Substances now shipped and stored in drums protected by such liners include water-borne dispersions and emulsions of latex, either natural or synthetic, and water-borne dispersion-type adhesives. Development work is proceeding apace, and it is expected that X-Crepe drum liners will soon be used in the shipment and storage of such materials as asphaltic products like roofing and caulking compounds; jelly-like materials similar to petrolatum; some resins; and chemicals, paints, waxes, food products, shortening, molasses, cottonseed, linseed and palm oils.

In effect, X-Crepe drum liners provide an easily removable and disposable drum coating, which precludes the necessity for cleaning. Depending on the application, a film such as Pliofilm or polyethylene which is chemically inert to the substance it is to contain is selected. The film is flexible, creasable, and pliable; fabricates into a liner easily, and conforms well to the drum. However, unsupported film of an inexpensive caliper is too flimsy for ready handling and easy insertion into the drum by packing room personnel. X-Crepe used in conjunction with the film provides the necessary support.

While X-Crepe supplies this support, because it is as flexible and formable as the film, it does not destroy in any way the desirable pliability and other properties of the film. It also serves as a buffer between the drum and the film, preventing any burring action on the part of the drum from rupturing the film to defeat the purpose of the liner. Punctures and blows are resisted by X-Crepe, which stretches to absorb them. The liner conforms to the shape of the drum, permitting complete filling of it.

To make the liners, X-Crepe and film as a unit are fabricated into a bag-type liner made-to-measure to fit any size drum. A fabrication process is used which avoids perforating the liner in any way, and the full strength of both materials is retained in all areas.

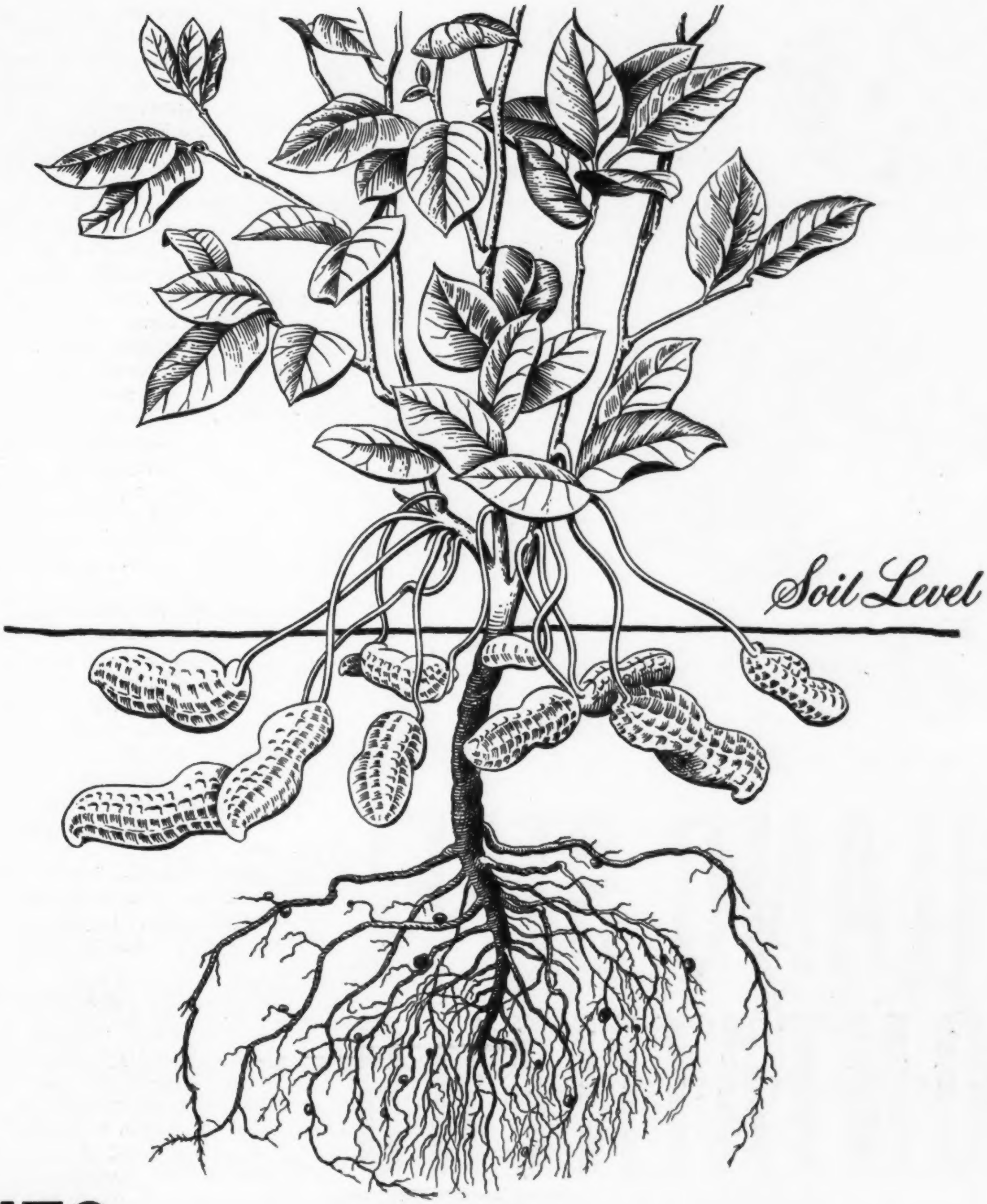
Drum cover protection is obtained by assembling the lid and its rubber washer, and spreading between it and the drum contents a sheet of film. The clamp ring is applied and tightened in the regular way, leaving the turned down edges of the X-Crepe drum liner and the film lid cover protrude, to act as an additional gasket.

When received at its destination, the drum is opened in the usual way, the film lid cover disposed of, and the drum emptied. The liner is then removed easily and thrown away, leaving the clean drum ready for immediate re-lining, refilling, and re-shipment.

Tape Dispensers Offer New Features

Answering the need for greater flexibility in gummed tape moistening, an improved pressure plate with a range of five settings has been introduced in the new Counterboy 500 Series, a group of eight tape dispensers now being marketed by Better Packages, Inc., Shelton, Conn.

The new pressure device is pivoted and equipped with an easily movable weight, enabling the operator to adjust moistening pressure quickly to the exact requirements of the specific tape weight or glue formula. By turning a set screw on the water fountain bracket, water level in the new machines can also be adjusted


Soil Level

to suit the needs of lighter and heavier tapes. Once set, water level is kept constant by automatic feed.

Another innovation in the moistening control unit is an unbreakable plastic water fountain bottle. The bottle is fitted with a heavy rubber slip-on cap and holds 16 ounces, eliminating frequent refills.

Counterboy 500-A is a general shipping room model engineered to measure tape-strips, from 4" to 50", on the upstroke of the handle. This new method of tape-length selection is designed to increase accuracy and lessen fatigue.

Another product offered by the same company is a pressure-sensitive ("tacky") tape dispenser that automatically feeds measured strips 1½", 2¼" or 3" long. This new sealer, called Big Inch No. 3, is designed to simplify application of pressure-sensitive tape in production and packaging and to effect economies of this comparatively costly sealing material by providing precise, predetermined short tape-lengths.

Big Inch No. 3 is easily adjustable to feed the desired length. A light, rapid lever stroke measures, dispenses and cuts the strip. Each cut strip is held flat against the feed reel until the operator peels it off for application. Thus, the waste of tape through snarling or missticking is avoided. Also, since the tape roll is completely enclosed, it is protected against dirt, damage and deterioration.

The weight and balance of this dispenser keep it steady in operation. This permits one-hand dispensing which leaves the operator's other hand free.

Glossary of Packaging Terms

A *Glossary of Packaging Terms,* as compiled by Gerry O. Manypenny, chairman, Packing Glossary Sub-Committee of The Packaging Institute, Inc., has been published, and can be obtained from that organization at 342 Madison Ave., New York 17, N. Y. The purpose of this book is an attempt to standardize basic terms used by the packaging industry in describing materials, processes, methods and machinery. The *Glossary* assembles and refines the work of many trade associations, companies and individuals, and makes their combined efforts available in a single volume.

Copies are priced at $1.75 to members and $2.75 to non-members.

Chemical Industry Ups Use Of Electrical Trucks

The chemical industry has more than tripled its purchases of storage battery-powered industrial trucks, a comparison of 1947 orders with the 1936-9 average reveals. A report just issued by The Electric Industrial Truck Association shows that sales of electric trucks to the

chemical industry rose from an index figure of 100 in the pre-war period to 334 last year. The number of users of trucks of this type in the chemical industry also has risen sharply—by 52.3 per cent since 1944.

Industry observers attribute this increased use of electric trucks to two major factors—the growing awareness among chemical plant executives of the advantages of unit-load handling of drums, cartons, carboys, barrels and bags of materials and product; and to the safety features, versatility of use and low maintenance requirements of battery-powered trucks.

Heat Sealing Labels

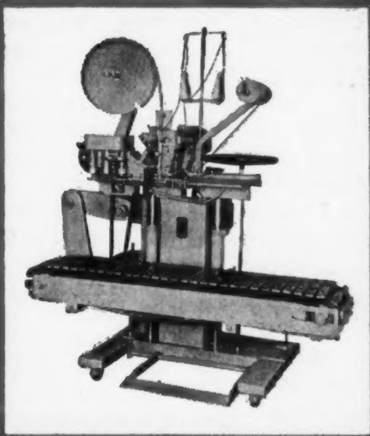
Operator in Westinghouse Electric Corp. Essington, Pa. plant applies Nashua Gummed and Coated Paper Co. Pervenac (thermo-kote) heat seal labels to tin cans. These precoated labels when made sticky by the heat from the Pervenactor in the foreground can be applied to metal, enamel, wood or cardboard.

MCA Manual on HF

The Manufacturing Chemists' Association has published Chemical Safety Data Sheet SD-25, Hydrofluoric Acid, the twenty-fifth in the series of MCA chemical product safety manuals. Designed for supervisory staffs and managements, these manuals concisely present essential information for the safe handling and use of hazardous chemical products.

The new manual sets forth the important physical and chemical properties of hydrofluoric acid; the usual shipping containers used for it, and methods for unloading and emptying the containers; container storage and handling; requirements for caution labels, and recommended personal protective equipment for workers who handle the acid.

Copies may be obtained at 20 cents each from the Manufacturing Chemists' Association, Inc., 246 Woodward Building, Washington 5, D. C.



MODEL "DA" (portable)—One operator filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to BAGPAKER* conveyor (quickly adjustable for various bag sizes). Starting and stopping of sewing operation is automatic . . . no tape wasted.

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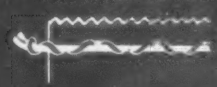

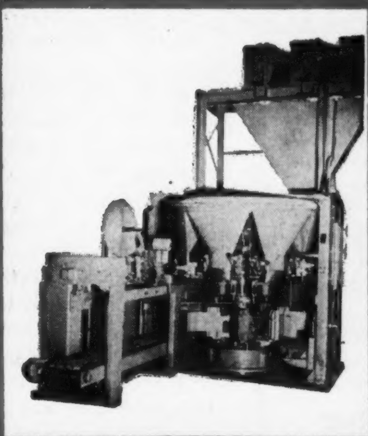

MODEL "A"—Completely automatic—extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine capable of filling and closing 100-lb. bags at the rate of 15 per minute . . . needs one operator.

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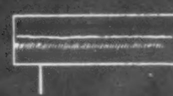

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PLANT OPERATIONS NOTEBOOK

Chemical Developments Introduce New Industrial Fire Hazards

A RECENT publication of the National Board of Fire Underwriters, "Controlling Industrial Fire Hazards," calls attention to a number of new chemical developments, which have provided further "problem children" for the plant engineer.

Fluorine

Fluorine is an extremely corrosive gas and the most reactive element. Because of its chemical activity, it was difficult to handle and dangerous to use on any large scale. It is capable of producing the highest possible flame temperature (exceeding the oxy-acetylene flame) and will support the combustion of glass and asbestos; a steel rod goes up in smoke, and water burns as its hydrogen and oxygen combine with fluorine—and its use is increasing.

Oxygen

"Concentrated packaging" of liquid oxygen in non-pressure, insulated vessels aboard truck-type trailers and railroad box-cars is now common practice Further, newer "tonnage oxygen" units are being installed on the users' premises, bringing the hazards attendant on handling large quantities of this material, well-known to producers, more strongly to the attention of the industry.

Another form of concentrated oxygen appears as 90% hydrogen peroxide in aqueous solution. This solution affords 400 volumes of oxygen, in contrast to the 10 volumes of oxygen of the ordinary 3% pharmaceutical grade. This agent may be decomposed rapidly by traces of certain impurities (dusty atmospheres) or by exposure to heat. The liberated exothermic heat is sufficient to convert the small amount of water to superheated steam with an explosive violence, causing sudden expansion up to 5,000 volumes.

Molten Salts

Certain steels and aircraft metals, such as aluminum and low-magnesium alloys, have stimulated the development of a heat-treating process involving molten salts over a temperature range of 300° to 2,400°F. Certain of these high-temperature fluids contain sodium and potassium nitrite-nitrate mixtures (for 1,000° F. operation). In the highly heated state, they become powerfully reactive and result in a violent explosion on contact with water or on accidental admixture of extraneous organic or combustible materials. Overheated salt baths have been reported to undergo a thermit-like reaction with aluminum articles and also cause a destructive attack on the walls of the containers, with eventual structural failure. Somewhat similar mixtures with similar dangers are also being used in the molten condition as heat-transfer media to control the temperatures of reactors and other chemical processing equipment.

Hydrides

Metallic hydride salts (hydrogen-liberating) for the descaling and "pickling" of metals and alloys are being introduced. These remarkably active and unique metal compounds, along with sodium amide and phosphorus oxychloride, are finding wide use in important organic synthesis.

Rapid-acting chemical agents, such as perchloric acid (involved in the Los Angeles blast of 1947) are increasingly being used for electropolishing, deburring and finishing various metal parts.

Current development work on and use of violently reactive chemical combinations for rocket and jet-propulsion fuels are posing many special safety problems.

Mass fumigation of warehouses and major structures with thermogenerated insecticidal smokes and ultrafinely dispersed colloidal vapors or "aerosols" is beginning to present new hazards through unsafe solvent carriers and incomplete safeguarding measures.

New Finishes

Extensive developments are occurring in the use of high-voltage electrostatics for spray deposition and dip-detearing of industrial coatings, and in the separation and recovery of fluidized solid catalysts in petroleum-vapor processing.

To maintain speed of production, drying and finishing ovens are being operated at increasingly elevated temperatures in diversified designs and under complicated operating controls to promote and keep up a high output of work. The occurrence of numerous fires and explosions has stimulated researches concerning the possible catalytic influences of various metal surfaces on lowering the ignition temperatures of flammable vapors and gases, and the redetermination of lower flammability values of these combustibles at actual over-operating temperatures (ranging upward to 1,000° F.), in contrast to the normally reported data.

Many other new industrial hazards could be added to this list, but the foregoing examples give sufficient evidence of the wide range of problems that will continue to tax the ingenuity and resourcefulness of fire protection engineers and the various fire fighting, services. It should also be apparent that fire prevention and fire protection are of necessity becoming more complicated, and, to keep pace with the industrial changes, there is definite need for an increasing amount of scientific knowledge to provide adequate safety controls and greater security against loss of life and property from fire and explosion.

NOMOGRAPH-OF-THE-MONTH Edited by DALE S. DAVIS

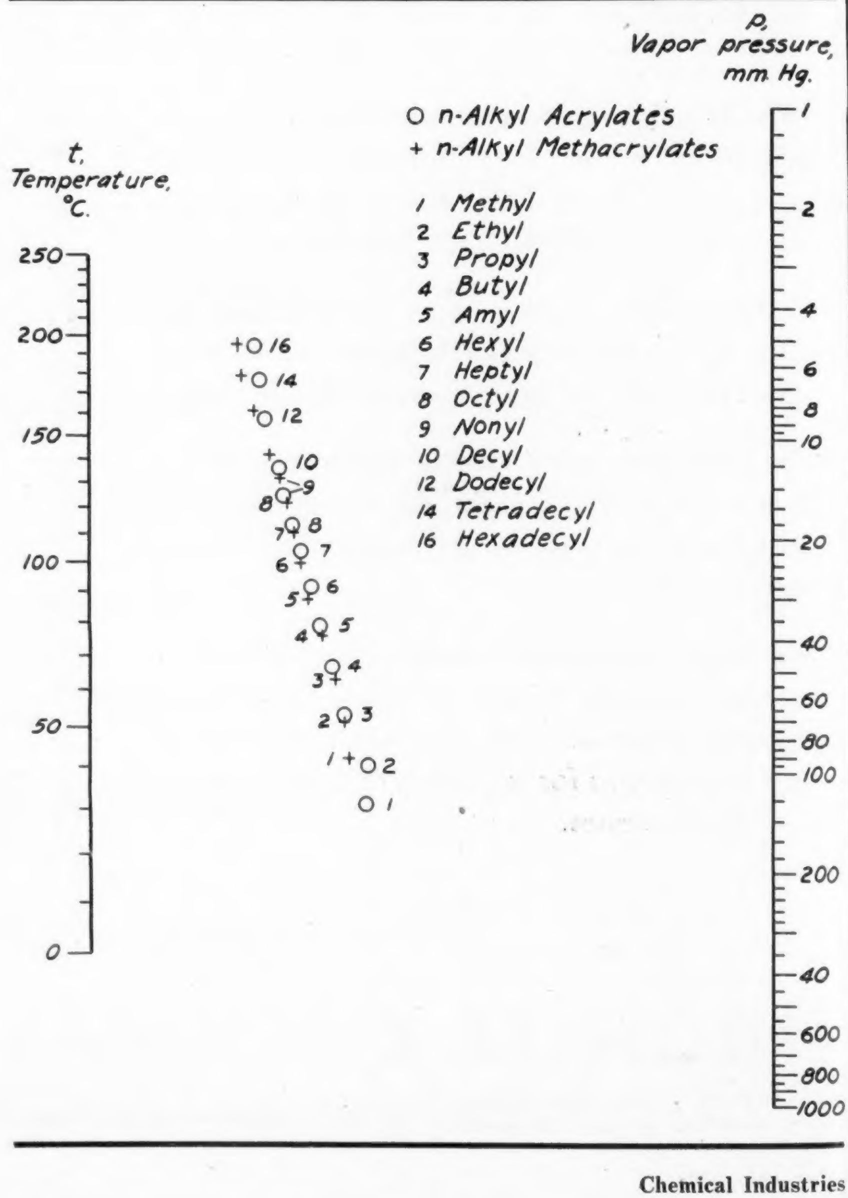
Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

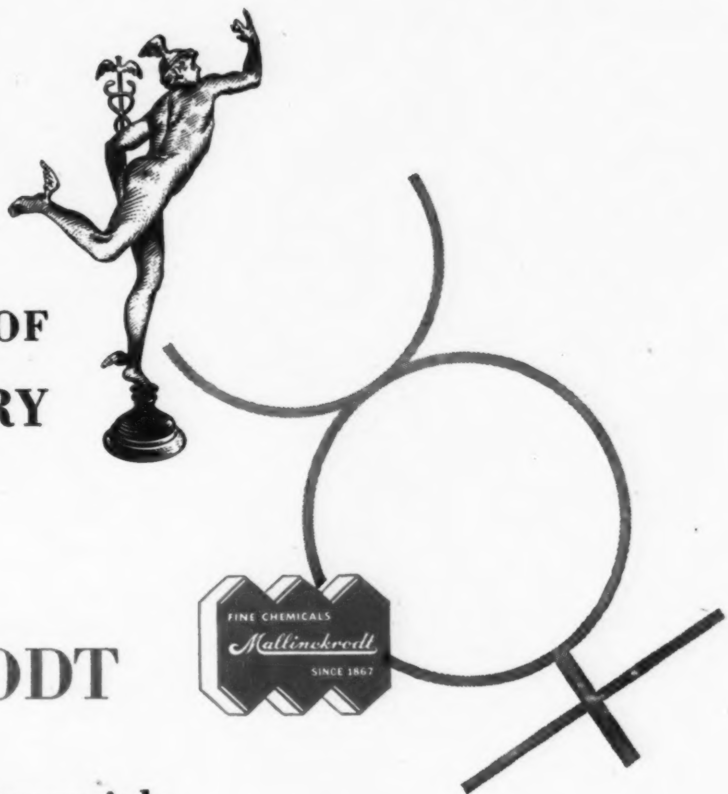
Vapor Pressures of n-Alkyl Acrylates and Methacrylates

by D. S. DAVIS, University of Akron, Akron, Ohio

CONVENIENT presentation of reliable data on the vapor pressures of n-alkyl acrylates and n-alkyl methacrylates is of interest in view of the growing importance of these compounds. The accompanying line coordinate chart is predicated on the linearity of the

(*Continued on page 891*)





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Mercuric Chloride A. R. (Gran) (ACS)
Mercuric Cyanide A. R.
Mercuric Cyanide N. F. VIII
Mercuric Iodide Red N. F. VIII
Mercuric Iodide Red A. R.
Mercuric Nitrate Granulated
Mercuric Nitrate A. R.
Mercuric Nitrate Ointment N. F. VIII (Citrine Ointment)
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Mercuric Oxide Red N. F. VIII
Mercuric Oxide Red N. F. VIII Powder
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Mercuric Oxide Yellow, Technical
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Mercuric Oxide Yellow A. R. (ACS)
Mercuric Salicylate N. F. VIII
Mercuric Sulfate Purified Granulated
Mercuric Sulfate A. R.
Mercurous Chloride Mild USP XIII (Calomel)
Mercurous Chloride Mild USP XIII (Precipitated Calomel)
Mercurous Chloride A. R. (ACS) (Powd)
Mercurous Iodide Yellow N. F. VIII
Mercurous Nitrate Crystals
Mercurous Nitrate A. R. (Cryst)
Mercurous Sulfate A. R.
Mercury Distilled
Mercury USP XIII Redistilled
Mercury A. R. (ACS)
Mercury Brilliant (Precision Tube Grade)
Mercury Ammoniated USP XIII Powdered
Mercury Mass N. F. VIII (Blue Mass)
Mercury Mass Dry Powder
Mercury (ic) Oleate USP XIII
Mercury with Chalk N. F. VIII
Mixture Corrosive Sublimate and Acid Citric
Mixture Corrosive Sublimate and Ammonium Chloride
Potassium Mercuric Iodide
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Nylon dyeing B540
"Studies on Nylon Dyeing". Bul. 798, American Cyanamid Co.

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"Let's Get Acquainted". 12 pp., J. M. Huber Corp.

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"Aluminum Alloys and Mill Products". 162 pp., Reynolds Metals Co.

Texas City H735
"The Texas City Disaster, Facts and Lessons". 16 pp., The National Board of Fire Underwriters.

Generator sets H736
"Low-Voltage Direct Current Motor-Generator Sets". Bul. G-102, Hanson-Van Winkle-Munning Co.

Machines H737
"Machines for Closing Multiwall Paper Bags". 8 pp., International Paper Co.

Valves H738
"Kinney Vacuum Tight Valves". Bul. 2448, 4 pp., Kinney Mfg. Co.

Equipment H739
"Product Index". 6 pp., E. F. Houghton & Co.

Necks, nozzles, covers H740
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Control H741
"L&N Electric Control, Position - Adjusting Type". Cat. ND4A (1), 40 pp., Leeds & Northrup Co.

Furnaces H742
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Wire screens H743
"Wire Screens Fabricated for Industry". Bul. No. 7, 4 pp., The Cleveland Wire Cloth & Mfg. Co.

Alloy castings H744
"Michiana Alloy Castings". Booklet 111, 16 pp., Michiana Products Corp.

Guidebook H745
"Planning and Engineering Guidebook for LCS Unit Substations". Bulletin 11B6895, 20 pp., Allis-Chalmers Mfg. Co.

Protective coating H746
"Enamel-On Industrial Finishes, Tuf-On". 4 pp., Brooklyn Varnish Mfg. Co., Inc.

Kansas H747
"3 Keys to Kansas". 26 pp., Kansas Industrial Development Commission.

Rope H748
"Rope Ol'ogy, 20 Questions About Preformed Wire Rope". 4 pp., Macwhyte Co.

Boiler return units H749
"Type XA Packaged Boiler Return Units". Bul. No. 200, Roy E. Roth Co.

Pump H750
"Molobilt Pump". Bul. No. 103, 4 pp., Roy E. Roth Co.

Pumps H751
"Roth Heavy Duty Flexible Coupled Pumps". Bul. No. 101, 18 pp., Roy E. Roth Co.

Vibration control H752
"Vibration Control Data". Bul. G-101, Korfund Co., Inc.

Pumps H753
"Model 40 Corrosion Resisting Series M Durcopumps". Bul. 815, 20 pp., The Duriron Co., Inc.

Office and factory productivity checklist H754
"Increasing Productivity in Factory and Office". 8 pp., American Management Assn.

Equipment H755
"Facts about Towmotor". Towmotor Corp.

Voltage stabilizer H756
"New ZR-6000 Voltage Stabilizer Line Bulletin". Raytheon Mfg. Co.

Electronic recorder H757
"Multi-Record Dynalog". Bul. 428, Foxboro Co.

Mill H758
"The Pennsylvania Steelbuilt Bradmill for Impact Reduction of Chemical Solids to Cubical Particles". Bul. No. 8002, 4 pp., Pennsylvania Crusher Co.

Steam Boilers H759
"Cause and Prevention of Lap Cracks in Steam Boilers". 8 pp., Mutual Boiler Insurance Company of Boston.

Film applicator H760
"Duplex Film Applicator". 4 pp., Henry A. Gardner Laboratory, Inc.

Shakers H761
"Eberbach Laboratory Shakers. Utility Shakers, Flask Shakers". Bul. 100, 4 pp., Eberbach & Son Co.

Viscosity bath H762
"Precision Model S Kinematic Viscosity Bath". 1 p., Precision Scientific Co.

Grease testing equipment H763
"Ball Bearing Grease Testing Equipment". Bul. GEC-316, 2 pp., General Electric Co.

Survey meter H764
"The Precision Model 101 Portable G-M Survey Meter". 2 pp., Precision Radiation Instruments, Inc.

Transformers H765
"Installation, Care, Operation of Dry Type Transformers". Bul. 61X7088, 16 pp., Allis-Chalmers Mfg. Co.

Process equipment catalog H766
"Esco Stainless and High Alloy Steels". Cat. No. 168, Electric Steel Foundry Co.

Welding branch pipe outlet H767
"Bonney WeldOlet for Branch Pipe Outlets". 22 pp., Bonney Forge & Tool Works.

Welding hose H768
"Simple and Quick Methods of Installing Hewitt Rubber's Patented Twin-Weld Welding Hose". Hewitt Robins, Inc.

Smoke indicator H769
"Electronic Smoke Indicators, Recorders, Overfire Jet Control". Bul. No. 20-A, 8 pp., Brooke Engineering Co., Inc.

Ram bender H770
"Automatic-Push Button Ram Bender—2" Pipe Capacity No. 1402". Bul. No. 34, Section K, 8 pp., Wallace Supplies Mfg. Co.

Voltage controllers H771
"New Line Low Voltage Controllers with Draw-Out Air Circuit Breaker". Bul. GEA-4939, General Electric Co.

Brazing fittings H772
"Instructions for Brazing Fittings to Pipe and Tubing with Easy-Flo and Sil-Fos". Bul. 17, 4 pp., Handy & Harman.

Analyzer H773
"Panoramic Sonic Analyzer". 6 pp., Panoramic Radio Corp.

Electric flares H774
"Big Beam No. 400-F Electric Flare Flashing or Steady". 2 pp., U-C Lite Manufacturing Co.

Pumps H775
"Champion Peerless Deep Well Turbine Pump for Small Diameter Wells". Bul. No. B-200, Food Machinery and Chemical Corp.

Corrosion resistance H776
"Standard Specialties for Strength, Corrosion Resistance, Long Life". 24 pp., International Nickel Co., Inc.

Ball bearings H777
"Miniature Ball Bearings". Cat. 49, 8 pp., Miniature Precision Bearings, Inc.

Motor repairing and installing H778*
"New Hi-Heat Resistant Lead Markers and Motor Connection Diagrams". MD Folder, 4 pp., W. H. Brady Co.

Thermal conductivity units H779
"Gow-Mac Ever-Tite Thermal Conductivity Units for Low-Cost Gas Analysis". 4 pp., Gow-Mac Instrument Co.

Fans H780
"Type LL Limit-Load Conoidal Fans". Bul. 3675, 37 pp., Buffalo Forge Co.

Mill H781
"Double Runner Attrition Mills". Bul. DR-448 & Supplements DRC-1, DRF-1, 12 pp., Sprout, Waldron & Co.

Insulation H782
"PC Foamglas". A.I.A. File No. 37-B, 4 pp., Pittsburgh Corning Corp.

Motors H783
"Heavy-Duty Synchronous Motors". Bul. 1100-PRD-181, 8 pp., Electric Machinery Mfg. Co.

Motors H784
"E-M Synchronous Motors". Bul. 1200-PRD-175, 4 pp., Electric Machinery Mfg. Co.

Bearings H785
"Bearing Corrosivity in Lubricants". Information Circular No. 3, Randall and Sons.

Mixer H786
"New Horizons in Mixing, Oakes Automatic Continuous Mixer". Form DM-499, 2 pp., American Machine & Foundry Co.

Valve H787
"Lunkenheimer Renewo Threesome". Circular No. 577, 12 pp., The Lunkenheimer Co.

Spray booths H788
"Schmieg Centri-Merge Spray Booths". Cat. 480, 10 pp., Schmieg Industries, Inc.

Equipment H789
"Dust and Fume Control Equipment, Spray Booths, Mechanical Washers, Industrial Ovens, Sheet Metal Equipment and Accessories". Cat. 481, 32 pp., Schmieg Industries, Inc.

Dust control H790
"Industrial Dust Control". Bul. No. 98, 24 pp., W. W. Sly Mfg. Co.

Flow tube H791
"Bethlehem Flow Tube". 6 pp., Bethlehem Foundry and Machine Co.

Pipe and fittings H792
"Karbate Pipe and Fittings". Cat. Sec. M-88003, National Carbon Co., Inc.

Temperature control H793
"The Gyco-Phen Electronic Temperature Control". Bul. G-70, 4 pp., Scientific Glass Apparatus Co., Inc.

Laboratory equipment H794
"What's New for the Laboratory". Bul. #6, 22 pp., Scientific Glass Apparatus Co., Inc.

Repair alloy H795
"Lo-Temp Metallic Repair Alloy". 6 pp., The John Hewson Co.

Starters H796
"A.C. Combination Magnetic Starters with Circuit Breakers". Bul. 4130, 4 pp., Ward Leonard Electric Co.

Jet blowers and blast nozzles H797
"SK Steam Jet Blowers and Blast Nozzles". Bul. 4-AB, Schutte and Koerting Co.

Trucks H798
"Towmotor Fork Lift Trucks". Job Study No. 79, Towmotor Corp.

Pumps H799
"The Airometric, A Controlled Volume Chemical Pump with Rotary Air or Gas Motor Drive". Bul. No. 488, 4 pp., Milton Roy Co.

Motoreducer H800
"The New Falk Motoreducer". Bul. 3101, 4 pp., The Falk Corp.

Control H801
"Photoelectric Registration Control". Bul. PD476, Photoswitch Corp.

Grinding and mixing equipment H802
"New Bulletin 260 on Mixing Equipment". Bul. 260, The United States Stoneware Co.

Paint H803
"Carbo-Kote". Bul. M-2, Carboline Co.

Generators H804
"New Tri-Clad High-Speed Synchronous Generators 900 Series". Bul. No. GEA-5125, 4 pp., General Electric Co.

Motors H805
"New Tri-Clad Motor Line High Speed Synchronous Motors, 900 Series". Bul. No. GEA-5113, 4 pp., General Electric Co.

Motors H806
"Synchronous Motors for the Lumber, Pulp and Paper Industries". Bul. GEA-5063, 4 pp., General Electric Co.

Equipment H807
"Pictorial Review of Interesting Contracts Completed by the Economy Pumps, Inc., Liberty Planers, Inc., Klipfel Mfg. Co." 16 pp., Hamilton-Thomas Corp.

Compression, dehydration plant H808
"Compression, Dehydration Plant Provides Full Gas Utilization". 4 pp., Clark Bros. Co., Inc.

Potentiometers H809
"Brown Electronik Potentiometers". Cat. 15-13, 32 pp., The Brown Instrument Co.

Lathes H810
"Micro Lathes Series 17". Cat. P17/CA8, 16 pp., Lorber Export Import & Purchasing Company.

Making concrete H811
"Trimix Makes Good Concrete Better". 6 pp., L. Sonneborn Sons, Inc.

Controls H812
"Wheelco Electronic Controls". Bul. Z6500 & Price List, 4 pp., Wheelco Instruments Co.

Temperature Control H813
"Duration-Adjusting Type Temperature Control". Cat. ND4A(2), 38 pp., Leeds & Northrup Co.

Equipment H814
"Brown Instruments for Treatment of Sewage and Industrial Wastes". Bul. No. 7301, 44 pp., The Brown Instrument Co.

Gas analyzers H815
"Burrell Industro Gas Analyzer". Bul. No. 213, 8 pp., Burrell Technical Supply Co.

Instrumentation system H816
"Atcotran, the New Precision Instrumentation System". Bul. R-10, 8 pp., Automatic Temperature Control Co., Inc.

Conveyor H817
"Floor-Veyor, Jr., Power Belt Conveyor". Form FJ-48, 2 pp., The Rapids-Standard Co., Inc.

Instruments H818
"Analytical Instruments for Science & Industry". Cat. CEC-1300A, 16 pp., Consolidated Engineering Corp.

Casting H819
"Precision Investment Casting". Bul. 19B6451A, 4 pp., Allis-Chalmers Mfg. Co.

Instruments H820
"Two New Low-Cost Portable Instruments, 60° Glossmeter, and 45°, 0° Reflectometer". 8 pp., Henry A. Gardner Laboratory, Inc.

Control panels H821
"Process Control Panels". Bul. No. 6148, Richardson Scale Co.

Tachometers H822
"Dependable Speed Measurement with Metron Tachometers". Bul. No. 104, 4 pp., Metron Instrument Co.

Lubrication H823
"Studies in Centralized Lubrication 1948". 6 pp., The Farval Corp.

Rotameters H824
"Rotameters and Flow Indicators". Bul. 18-RA, 4 pp., Schutte and Koerting Co.

Electric heat H825
"Electric Heat Uniformly Controlled". Bul. No. 0-40-W, 4 pp., Sta-Warm Electric Co.

Valves H826
"Grove Chex-Flo Check Valves". Bul. #610-B, Grove Regulator Co.

Valves H827
"Grove Flexflo Expansible Tube Valves". Bul. #800-B, 16 pp., Grove Regulator Co.

Hydraulic presses H828
"All-Hydraulic Presses for Metal Working and Process Industries". Bul. 4804, 12 pp., The Hydraulic Press Mfg. Co.

Fume hood H829
"Fisher Laboratory Fume Hood Complete with Integral Motor and Blower, Ready to Install". 6 pp., Fisher Scientific Co.

Corrugated packing H830
"Speed Packing Manual". 44 pp., Sherman Paper Products Corp.

Aluminum fabrication H831
"Aluminum Fabrication, Any Thickness for Normal or Extreme Sub-Zero Temperature Service". Bul. No. A-48 (Preliminary) 6 pp., The Stacey Bros. Gas Construction Co.

Batteries H832
"National Battery Company Research Laboratory Report on The Theoretical Power Output of Storage Batteries". 14 pp., National Battery Co.

Brushes H833
"Standardization of Carbon, Graphite and Metal-Graphite Brushes for Motors and Generators". Cat. Sec. B-2106, National Carbon Co., Inc.

Valve H834
"Cochrane Zeolite Systems & Pressure Filters featuring the Hydromatic Single Control Valve". Bul. No. 4460, 8 pp., Cochrane Corp.

LABORATORY NOTEBOOK

Underground Corrosion

A study of some of the factors involved in electrical protection against underground corrosion has been made by I. A. Denison and Melvin Romanoff of the National Bureau of Standards, Washington 25, D. C. In six of a total of eight test sites, corrosion of steel specimens was adequately prevented over test periods ranging from three to six years by connecting zinc cylinders to the steel. It was found that the current required to prevent the corrosion of steel electrolytically was approximately equal to the current associated with normal corrosion and hence could be taken as a measure of the corrosion rate in the soils which were studied.

In the protection of pipe lines electrolytically, it is desirable to be able to measure accurately the current that will just protect a given area. Otherwise, the pipe line may be incompletely protected; or, in the event of overprotection, expensive power may be wasted, with possible damage to adjacent structures on which the excess current would tend to collect and discharge. The potential of steel rings was measured as increasing currents were caused to flow toward the rings from an external source. At low currents the potentials of the rings remained constant; but after some transition, the potentials were observed to increase linearly with the logarithm of the applied current. The value of the applied current that was just sufficient to prevent corrosion of the cathodes was found to be indicated approximately by the departure of the potential from the constant value at low currents.

Standard Hydrocarbons

The National Bureau of Standards and the American Petroleum Institute, through a cooperative program begun in 1943, have prepared a total of 144 compounds now available as NBS standard samples of hydrocarbons for calibrating analytical instruments and apparatus in the research, development, and analytical laboratories of the petroleum, rubber, chemical, and allied industries. The most recent additions to the series of compounds are: 4-methyl-trans-2-pentene; 2,2,4,6,6-pentamethylheptane; 1-undecene; 2,3-dihydroindene (Indan); 4-ethenyl-1-cyclohexene (4-vinyl-1-cyclohexene).

Refractive Indexes in Infrared

Thallium halide crystals (42% thallium bromide and 58% thallium iodide) have enabled the measurement of refraction indexes from the yellow mercury lines to 39.2 microns in the infrared, according to the National Bureau of Standards. Previous materials, e.g., potassium bromide, were limited to 24 microns.

Glass Blowing Lathe

The 3,400 pound, nine-foot glass blowing lathe recently installed in Monsanto Chemical Company's research laboratories in St. Louis can handle pieces up to twenty-seven inches in diameter or more than nine feet long in asbestos padded steel fingers. At full speed the ten flame jets consume 244 cubic feet of oxygen a day, and proportionate amounts of natural gas.

INDUSTRY'S BOOKSHELF

Organic Reagents For Analysis

ORGANIC REAGENTS USED IN GRAVIMETRIC AND VOLUMETRIC ANALYSIS *by John F. Flagg.* Interscience Publishers, Inc., New York, 1948; 300 pp. $6. Reviewed by Norman H. Ishler, General Foods Corp.

A VALUABLE service has been rendered the analytical chemist by making available in one volume the information contained in this monograph. Much of the material has been obtainable from the literature and several texts on allied subjects which the author freely acknowledges. However, a large amount of comparatively inaccessible literature in the form of Russian and German works has been incorporated in detail in the practical applications section of this volume. By limiting the field of organic reagents covered, the author has been able to provide a good background of both theory and application.

The first ninety-one pages of the book are devoted to general discussion of the characteristics of organic precipitants for inorganic ions, the solubility of their complexes, their specificity, and principles on which future developments may be based. A generalized discussion of techniques used in this type of analysis is also included. The volumetric applications with which the text is concerned are those made possible by bromination, oxidation, or hydrolysis of the precipitated complexes. The latter section of the book, entitled "Special Reagents" is devoted chapter by chapter to each of fourteen reagents or reagent types which have been demonstrated to be especially effective. Anion precipitants as well as those for cations are included. In each of these chapters are given detailed descriptions of procedures found satisfactory.

Dr. Flagg makes it clear that he has no illusions concerning the specificity of the reagent types which he describes. Their limitations are well defined as are their potentialities. Occasionally the avoidance of descriptions of common colorimetric applications of gravimetric reagents becomes awkward, but these situations are handled straightforwardly.

Mechanically, this volume is excellent and shows the results of detailed proofreading. Careful perusal revealed only slight errors such as a subscript Z omitted from equation 3, p. 48, and footnote 19 on p. 165 refers incorrectly to p. 52 instead of p. 157.

Both author and publisher are to be congratulated on the production of this comprehensive and valuable volume.

CWS in the War

THE CHEMICAL WARFARE SERVICE IN WORLD WAR II *sponsored by the Chemical Corps Association.* Reinhold Publishing Corp., New York, 1948; 222 pp., $4. Reviewed by F. S. Swackhamer, Shell Chemical Corp.

THIS book, the publication of which was sponsored by the Chemical Corps Association (now the Armed Forces Chemical Association) is a brief report on "the mission, activities and accomplishments of the CWS in World War II."

The first half of the book outlines the changing organization of the Chemical Warfare Service during the period 1940 to 1945, describes the research and development activities, the procurement and supply of CWS materiel for the Army, Navy and Air Forces, and the offensive and defensive training which was carried out in the United States.

The latter portion of the book describes the activities of the CWS in the theatres of operation, devoting three chapters to the use of specific materiel, one on the 4.2 in. chemical mortar, the second on various types of smoke generation and the third on flame throwers. The final chapter describes "By-Products From the Implements of War" which are examples of the use of CWS materiel in peace time. This relates, for example, how the smoke-making apparatus now offers peacetime possibilities in protecting crops from frost, and how flame throwers may be used for burning out weeds in Louisiana cane fields. The fifteen appendices contain lists of chemical warfare units of various types and the principal private contractors for the Chemical Warfare Service who were active during the war.

The book constitutes a rather comprehensive report but it is not particularly easy to read. No personalities are mentioned, nor are any anecdotes recounted to illustrate the various points noted. A wealth of such material is available in the CWS records and more may be gleaned in conversation with the officers and men who made up the wartime CWS.

The account of the variety of activities of the CWS within the Army Air Forces is by no means complete. No mention at all is made of the AAF Chemical Warfare School, set up by War Department Directive, which rivaled the Chemical Warfare School at Edgewood Arsenal in the training of enlisted specialists, unit

gas personnel, and Chemical Warfare Units. The role played by the Air Chemical Officer in the development and procurement of CWS supplies, too, has been glossed over.

However, the book is one which many ground and service force chemical officers will want to have on their bookshelves and it is a good, brief reference work.

Color Laws and Theory

AN INTRODUCTION TO COLOR *by Ralph M. Evans.* John Wiley & Sons, Inc., New York, 1948; 3440 pp., $6. Reviewed by Willy A. Schmidt, General Aniline & Film Corp.

THIS new book on color offers the reader a wider perspective on the subject than has been covered in a single volume before.

A brief discussion on the complexity of the phenomenon "Color and Light", and an introduction to the system of nomenclature, as given by the Committee on Colorimetry of the Optical Society of America, is in the first chapter.

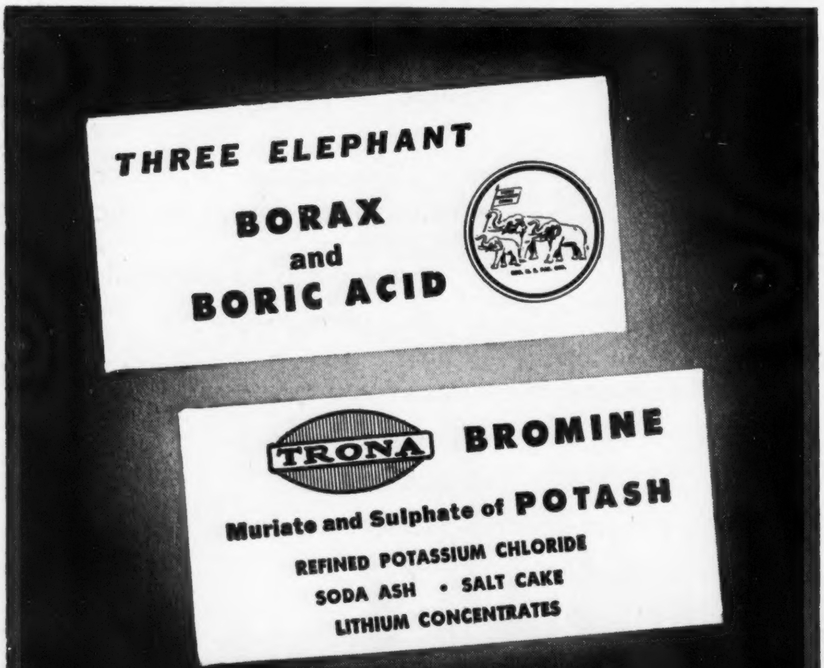
Five chapters (The Physical Nature of Light — Light Sources — Illumination — Colored Objects—and The Physics of Everyday Color) deal with the application of the laws of physics to the subjects. From an explanation of very fundamental principles such as curves as a graphical presentation, the reader is led through the field of optics to gain an understanding of such terms as additive and subtractive color effects.

The next five chapters refer to nonphysical aspects of color. Such important terms as hue, saturation, and brightness are introduced, and brightness adaption, perhaps the most marvelous function in the coordination of human senses and brain, is demonstrated and described.

The Measurement of Color—and The Specification of Color—acquaint the reader with methods and definitions which have been applied and which have become generally accepted. The ICI system in the form of its chromaticity diagrams serves to illustrate important points in the succeeding chapters—Color Differences and Color Names—Mixtures of Colored Lights—Effects of Illuminants—Transparent Colorant Mixtures—Paints and Pigments—and Color in Photography.

The concluding chapters—Color in Art—and Design and Abstraction—can be considered a summarization and application of the previous text, sending the reader off to his own and particular field in which color may be important.

The author, "in twenty years of active work in the fields of color and color photography", has found it necessary to write down the principles which are presented in an excellently organized form in this book. A large number of skillfully chosen graphs and tables and fifteen full page color plates illustrate the



"descriptive and non-mathematical", well printed text.

The book should find very wide acceptance by everyone who utilizes color as a tool or an expression, by the artistically inclined individual who lacks technical background, and by the technician who is inexperienced in the analysis and appraisal of aesthetic and psychological effects. All workers and enthusiasts in the field of color photography will find valuable information and explanations in the various chapters of this book.

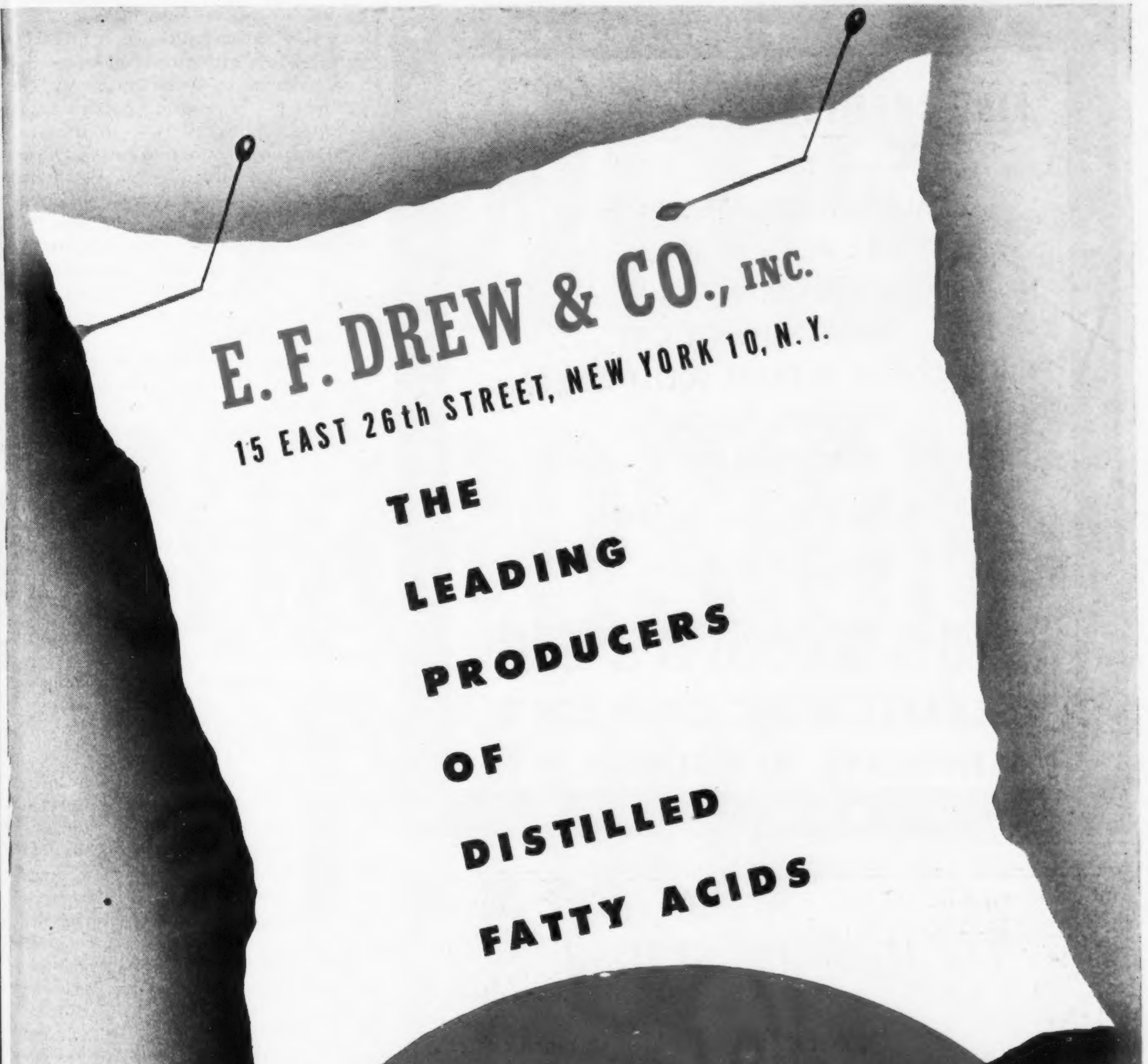
"Quant" Calculations

CALCULATIONS OF QUANTITATIVE ANALYSIS *by Philip W. West.* The MacMillan Co., New York, 1948; 162 pp., $2.75. Reviewed by Chester A. Snell, Foster D. Snell, Inc.

THIS VOLUME is a somewhat abridged edition of similar books with similar titles. Nothing noteworthy seems to have been added and, because of its size, some material has been omitted that should have been retained to cover the full scope of the title. These include, among others, chapters on gas analysis and potentiometric methods of analysis.

Each chapter begins with a brief discussion of the analytical method with illustrative problems worked out. The balance of the chapter consists of problems for the mental calisthenics of students of quantitative analysis. These problems frequently bear little resemblance to practical analytical procedures. For example, hydrochloric acid is standardized on page 32 by precipitating and weighing silver chloride, and on page 63 by weighing the remaining calcite after reaction with a weighed crystal of calcite. Granted that either of these might be used and that the former is probably the most precise method for such a standardization, under certain conditions, they are not the usual methods. In an example on page 36 an industrial analyst is purported to have made titrations on three samples each weighing 1.000 gm. On page 55 hydrochloric acid is added in excess to a known weight of sodium carbonate and back-titrated with sodium hydroxide solution to standardize the hydrochloric acid. The sodium hydroxide solution is titrated against the hydrochloric acid and the appropriate correction made. Thus we have four buret readings instead of the usual two in titrating sodium carbonate hot to standardize acid.

The author uses titer to a great extent in expressing concentrations. This is used only in the most routine control laboratories where large numbers of similar determinations are made. Here again the examples are confusing and inaccurate. On page 26 soda ash is analyzed for sodium carbonate content with a blithe disregard of the fact that some of the impurities are probably alkaline salts also. Similarly, in an example on page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38, the fact that the impurity in a 94 per cent pure sodium hydroxide is probably partly sodium carbonate is ignored.

The chapter on Reliability of Analytical Results is quite good for such a brief discussion (pages 133-142). It is somewhat amusing, however, to see a problem on page 62 calculated to four significant figures when the equivalent weight given for sodium carbonate is 106/2. Since the molecular weight of sodium carbonate is 106.00 the result is justified, but not as it is expressed in the problem. Several references are given to more extensive discussions of reliability.

The appendix contains a graphic logarithm table. This is not new but is not very common. It is questionable whether it has any advantage over the usual table. The binding is good and the type very legible. Unfortunately the publishers have followed a recent trend and bound this volume in light blue. This does not seem to be a good idea for a book that may be used in the laboratory.

Engineering Text

DISTILLATION AND RECTIFICATION *by Emil Kirschbaum.* Chemical Publishing Co., Inc., New York, 1948; 426 pp., $10. Reviewed by J. F. Skelly, M. W. Kellogg Co.

THIS is an English translation of a German book originally published in 1940 and reprinted here in German during the war. It covers the general subject of the process engineering design of fractionating towers, with little or no mention of reboilers, condensers, instruments and other auxiliaries. The metric system together with German symbols and terminology are retained. Drawings and graphs are reproduced unchanged from the original printing with English translations of German captions placed beneath each sketch. The book's value to the American engineer will be severely limited by its inevitable obsolescence augmented by the author's German viewpoint.

The translator, M. Wulfinghoff, has endeavored to modernize the text by appending a sixteen-page review of American developments since the author finished his work in 1939. The technical richness of this appendix demonstrates the great advances which have occurred here during the past decade and which now overshadow much of Kirschbaum's original text.

The elements of fractionation are presented in a careful and detailed manner but the author's pedagogy is far below that common in the better American text books. The class-room value of the book is further diminished by the absence of American problems for student solution.

Distillation specialists will find the volume useful for its detailed picture of pre-war German practices with all the virtues and limitations thus implied.

NEWS OF THE MONTH

Lion Schedules Two New Plants

Lion Oil Co. has signed contracts for two new construction projects at its chemical plant near El Dorado, Arkansas: a sulfuric acid plant and an ammonium sulfate plant, the two projects estimated to cost approximately $2 million. These projects which are in addition to the $3.5 million expansion of the anhydrous ammonia facilities already under way, are scheduled to start this month and be completed by September, 1949.

The larger of the two new plants will be the sulfuric acid plant which will be of the "contact" type. This plant, when burning 100 tons per day of Texas bright sulfur or equivalent, will produce 300 tons per day of sulfuric acid. Vanadium catalyst will be used in the operation.

The sulfuric acid plant is estimated to cost $1.25 million and the Chemical Construction Corp. of New York is under contract on a cost-plus-fixed-fee basis for the design, engineering and procurement of all materials. Chemical Construction will also be the contractor for the actual construction of the sulfuric acid plant.

The ammonium sulfate plant will consume 288 tons per day of sulfuric acid and 100 tons per day of ammonia to produce a total of 380 tons per day of commercial grade ammonium sulfate. The complete plant is estimated to cost approximately $750,000 and the Chemical Construction Corp. is under contract to engineer, procure materials and supervise the construction of this plant. The contract for the actual construction of the sulfate plant has been awarded to the Blaw-Knox Construction Co. of Pittsburgh, Pa.

British Firms Eye Canada

Over 100 British firms of international repute are currently negotiating with the British Treasury for power to open up manufacturing units in Canada. Approval for the first eight firms, including British Glues and Chemicals, has been granted. Other chemical companies are among those that can be expected to follow.

These manufacturers will settle in Ontario and are obtaining authority to spend some of the 100 million dollars the Treasury is known to be considering for Canadian investment. Certain of these concerns have already Canadian subsidiaries or associates and this further development is intended to permit the fullest expansion in North America of their manufacturing capacity and skill. It is regarded in London that this development—which is paralleled by similar development by British companies in Australia, New Zealand, South Africa and the Colonial Empire—marks the determination of British industry to operate from the most favorable location in exploiting expanding markets. Operation from Canada would give these companies an increased scope for expansion in the United States. British Glues and Chemicals has been firmly established in Canada for some time through a wholly owned subsidiary, Canadian Organic Development.

Nevins Heads New Mathieson Department

S. L. Nevins, who has joined Mathieson Chemical Corp. as general manager of the company's newly formed ammonia department. He has been with Southern Acid & Sulphur Co., Inc. since 1921.

General Aniline Lists Patents for Licensing

General Aniline and Film Corp. has placed 3,118 patents owned by the firm on the Register of Patents Available for Licensing or Sale maintained by the U. S. Patent Office. By this action the corporation makes these patents available to other firms and individuals for licensing upon terms to be negotiated.

These patents are within the broad classifications of dyestuffs and intermediates; textile assistants, detergents, water-softeners and other surface-active agents; miscellaneous organic compounds and processes; photographic; and sensitized materials and apparatus.

About 30,000 patents have been listed on the Register since it was established in June, 1945, to provide a medium of contact between patent owners and firms seeking new devices to manufacture. A number of firms have previously listed large blocks of patents.

Monsanto Negotiates For De Nora Cell

Monsanto Chemical Co. has reached a tentative agreement with Dr. Oronzio De Nora, head of an Italian company engaged in the manufacture and sale of electro-chemical plants, for the use and sale of his company's mercury cell in the U. S. The De Nora cell is for the manufacture of chlorine, caustic soda and hydrogen.

In addition to production of pure caustic in strengths up to 70% without concentration, the De Nora cell is said to produce chlorine and hydrogen of high purity at costs competitive with the best diaphragm cells now in use. Monsanto's engineering sales department will handle the sale of the new cell and also of complete chlorine plants.

Site Near Schenectady For New Atomic Reactor

The United States Atomic Energy Commission will acquire 4500 acres of land in Saratoga County, New York, as the location of an experimental atomic power plant for studies of the generation of electric power from nuclear energy. The plant will be part of the facilities of the Knolls Atomic Power Laboratory, operated for the Commission by the General Electric Co. at Schenectady. The Army Engineers will serve as agents of the Commission in the acquisition of the new site.

The nuclear reactor, the heart of an atomic power plant, is to be quite different from the production reactors at the Hanford Works in the state of Washington. The Hanford plant, now operated by General Electric, was built during the war for the sole purpose of making plutonium for military purposes and generates no useful power.

The new Knolls reactor is one of two now being designed especially for the study of high temperature operation and the production of power. A different type of reactor but for a similar purpose is planned at the Argonne National Laboratory near Chicago. The design of both these reactors is directed to the problem of power generation by nuclear fission but by different methods, and both are expected to yield important data

leading ultimately to the design of reactors which will produce power on a practical scale. They will also be valuable in solving some of the problems involved in "breeding" nuclear fuel.

In the operation of a nuclear reactor, the fuel consumed consists of fissionable material which produces heat for conversion into power. If the so-called breeding process works as expected, the reactor will more than replenish the fuel consumed in operation. In addition to producing heat, a breeder type reactor would convert non-fissionable Uranium-238 into new fissionable matter.

Phillips Buys Houston Plant Site

Phillips Chemical Co., a wholly-owned subsidiary of Phillips Petroleum Co., has purchased the Todd Shipyard property on the Houston Ship Channel, and will begin construction of a $4-$5 million ammonium sulfate plant. The 338-acre tract with all docks, buildings, supplies and improvements, has been sold to Phillips by War Assets Administration.

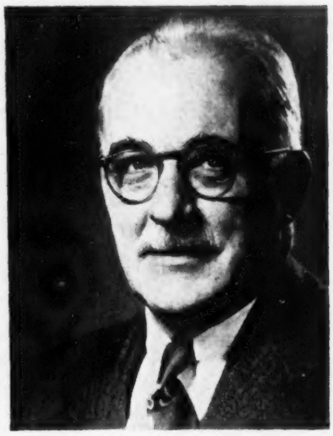
Prior to actual acquisition of the facilities, rechristened "Port Adams," Phillips had already made preliminary surveys of the property and construction of the first chemical unit will be started immediately. This has been designed to produce 266,000 tons per year of ammonium sulfate. Because of the buildings and facilities already available on the site, half the plant's capacity will be in operation before December 1, 1948, and total capacity will be reached early in 1949. The contractor employed for the ammonium sulfate plant is Chemical Construction Corp.

The plant's entire production of ammonium sulfate has been contracted to the Army until June 30, 1949. All deliveries will be made to ships supplied by the Army at the company's docks. This means increase of more than one quarter million tons of out-bound shipping per year on the channel.

Anhydrous ammonia will be supplied to the sulfate plant from the Cactus Ordnance Works near Etter in the Texas Panhandle. This plant, which now produces 200 tons of ammonia per day, was leased to Phillips Chemical Co. by the Army last August. The company is now rushing construction of additional facilities to increase the plant capacity to over 400 tons a day which is sufficient to make approximately 500,000 tons of nitrogenous fertilizer a year. The company is also constructing an ammonium nitrate plant near Etter, Texas.

In addition to the sulfate plant, the Port Adams property will be used for future expansion of the company's chemical operations and will also be used as an export-import terminal.

American Cyanamid Names Campbell



Arthur J. Campbell, appointed division manager of American Cyanamid Co.'s industrial chemicals division. He formerly was general sales manager of this division.

$17 Million Settlement For Texas City Claim

Monsanto Chemical Co. has completed negotiations for settlement of the insurance claims for losses sustained at the Texas City plant which was largely destroyed by the ship explosions there April 16, 1947. Negotiations were concluded

with the Oil Insurance Association of Chicago, which is a group of many leading stock insurance companies. The sum agreed upon was $17,312,000, believed to be the largest single insurance payment in history. The amount Monsanto originally claimed was $21,542,999.

National Lead Absorbs Titanium Alloy

National Lead Co. has taken over the business of Titanium Alloy Manufacturing Co. Included are the head offices of Titanium Alloy Manufacturing Co. in New York City and its plant at Niagara Falls, which will be operated as a division of National Lead Co., starting immediately.

The Niagara Falls plant produces compounds of zirconium for use in the ceramics industry and alloys of titanium for use in the ferrous and non-ferrous metal industries. The company has also developed a field for the use of titanates in radio, radar and television.

Monsanto Producing Vinyl Chloride Resins

Monsanto Chemical Co. has begun commercial production of vinyl chloride plastic resins. Production follows several years of extensive pilot plant and research investigation and plant building. Present facilities for manufacturing resin will be followed shortly with calenders to produce both thin and heavy gauge film. Both the resins and the film will be sold under the trade name Ultron.

Calkin Forms Firm

John B. Calkin, coordinator of research for Union Bag & Paper Corp., has formed his own consulting business in the pulp and paper, and chemical process industries. Offices will be at 500 Fifth Avenue, New York City 18. The service will concern problems of development, improvement, market research, and packaging.

Natural Gasoline Capacity Increases

During the 2-year period January 1, 1946 to January 1, 1948, the natural gasoline industry in the Uuited States increased the total capacity to produce light hydrocarbon products from 17,928,000 gallons (426,860 barrels) to 21,322,000 gallons (507,670 barrels) a day, according to a biennial survey of the Bureau of Mines.

Although blending with refinery products to make motor fuel is the primary use of natural gasoline—which is extracted from natural gas—several special fuels and materials come from natural-gasoline plants, such as airplane fuels, solvents, polymerization feed stocks, and liquefied petroleum gases.

Expansion of the industry in 1946 and 1947 was slightly greater than that experienced during the last two years of the war, 1944 and 1945, when demands for petroleum products were high. Production facilities were increased about 6 percent in both 1944 and 1945, compared with about 9 percent annually during the first two postwar years.

In spite of the enlarged daily production capacities, the total number of all types of natural gasoline plants in the last two years declined from 626 to 549. The recycling division of the industry, however, increased the number of plants from 37

Courtesy of Becton, Dickinson & Company, Rutherford, New Jersey

PENNSALT *hydrofluoric acid*

. . . for ETCHING · POLISHING · FROSTING

Many glass manufacturers everywhere have shown a preference for Pennsalt Hydrofluoric acid . . . and found that it fulfills exacting requirements . . . from etching precision medical instruments of glass, to frosting, polishing and etching fine decorative glassware.

In addition, Pennsalt HF is reliable for frosting electric light bulbs, pickling stainless steel, cleaning castings, improving the quality of glassmakers' sand and other important industrial raw materials . . . as well as in the preparation of fluorine compounds.

Pennsalt HF is available in strengths of 30%, 52%, 60% and 80% for domestic users; 71-75% for export. Strengths 60% and above shipped in steel containers . . . weaker strengths in rubber drums. Write for full details. Heavy Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

OTHER PENN SALT PRODUCTS

for glass and ceramic industries

Aluminum Hydrate • Calcined Alumina • Ferric Chloride, anhydrous • Kryolith* (Natural Greenland Cryolite) • Muriatic, Nitric, Sulphuric Acids • Salt Cake.

*Reg. U. S. Pat. Off

to 39 and continued to account for about 27.5 percent or 5,857,000 gallons of the industry's daily potential output. The daily capacity of the average plant in the industry was enlarged from 28,600 gallons on January 1, 1946 to 38,000 gallons on January 1, 1948, continuing a long-established trend to producing units of greater size and efficiency.

Kuhn Chairman of ACS Petroleum Division

Wayne E. Kuhn, manager of the technical and research division of The Texas Co., who has been elected 1948-49 chairman of the division of petroleum chemistry of the American Chemical Society. He succeeds Gustav Egloff, director of research of the Universal Oil Products Co.

Flaxseed Squeeze Imperils Linseed Oil

Flaxseed crushers must pay at least $6.00 per bushel for flaxseed under the government support program. The value of the linseed oil from a bushel of flaxseed at the Commodity Credit Corporation support price (which is also the current market) plus the value of the linseed meal from a bushel of flaxseed at the current market is about fourteen cents per bushel below the $6.00 per bushel flaxseed price, plus production costs, the latter placed at a figure agreed upon by CCC and crushers. The figures place the crushers in an impossible situation, with the only alternative either to amend the processor contract, or, as a last resort, withdraw from the flaxseed market.

At a recent meeting with Production and Marketing Administration officials in Washington, the situation was thoroughly discussed, and a proposal submitted by crushers that, in order to permit them to continue to pay the full support price, CCC agree to reimburse crushers 90% of whatever amount their meal sales price for the season might average under the $65.00 basic contract price. Crushers would stand the remaining 10% loss

Anhydrous Citric Acid offers a more economical source of this acid, and at the same time you assure yourself of Pfizer quality. By using Pfizer Citric Acid Anhydrous you benefit from these savings:

First, you save on *shipping expense* because Pfizer Citric Acid Anhydrous contains no water of crystallization, and you pay freight only on the citric acid you buy and not on water! Figures show you pay freight on only 91.42 lbs. of acid instead of the full 100 lbs. of normal U.S.P. Citric Acid. This means over 8½% less on every freight bill!

Second, you save on *storage space* and *handling charges* because 10 drums of Citric Acid Anhydrous are equivalent to 11 drums of the U.S.P. acid. This means you eliminate one drum out of every eleven you formerly stored and handled.

Citric Acid Anhydrous is a granular product, identical in purity with the U.S.P. Citric Acid, and differs only in that it contains no water of crystallization.

Solutions prepared with Citric Acid Anhydrous are identical with Citric Acid U.S.P. provided, of course, that you make allowance for the water always present in the U.S.P. acid. And, unlike the U.S.P. Acid, the Citric Acid cannot dry out, thus overcoming any possible variations in the resulting acidity of your solutions. For further details, please inquire of Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 211 E. North Water St., Chicago 11, Illinois; 605 Third Street, San Francisco 7, Calif.

PFIZER QUALITY

PFIZER

Manufacturing Chemists Since 1849

themselves. This proposal was rejected by CCC and crushers have withdrawn from the flaxseed market.

CCC started buying flaxseed in the Minneapolis market at the support price, with the reported intention of instituting a major export program on flaxseed, supplying European mills with crushing materials. Although the price support was set up to make certain that enough flaxseed was grown to produce our essential requirements of linseed oil, and to free us from Argentine domination, this purpose could be defeated by an export program.

CALENDAR *of* EVENTS

AMERICAN CHEMICAL SOCIETY, Division of Industrial and Engineering Chemistry, 15th annual chemical engineering symposium, Massachusetts Institute of Technology, Dec. 28-29.

AMERICAN CHEMICAL SOCIETY, Pittsburgh Section, 4th annual analytical symposium, William Penn Hotel, Pittsburgh, Jan. 20-21.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, regional meeting, Los Angeles, Cal., March 6-9.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Fairmount Hotel, San Francisco, Cal., Feb. 13-17.

AMERICAN MANAGEMENT ASSOCIATION, 18th National Packaging Exposition, Auditorium, Atlantic City, N. J., May 10-13.

AMERICAN PAPER AND PULP ASSOCIATION, annual meeting, Waldorf Astoria, New York City, Feb. 21-25.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 44th annual meeting, Hotel Statler, Washington, D. C., Dec. 5-8.

AMERICAN SOCIETY FOR TESTING MATERIALS, spring meeting, Hotel Edgewater Beach, Chicago, Feb. 28-March 4.

CHEMICAL MARKET RESEARCH ASSOCIATION, New York City, Feb. 10.

COMPRESSED GAS MANUFACTURERS ASSOCIATION, INC., annual convention, Waldorf Astoria, New York City, Jan. 17-18.

NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, New Yorker Hotel, New York City, Dec. 6-7.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION, winter meeting, Edgewater Beach Hotel, Chicago, March 13-18.

NORTHEASTERN WOOD UTILIZATION COUNCIL, quarterly meeting, Parker House, Boston, Dec. 15.

TANNERS' COUNCIL OF AMERICA, leather show, Waldorf Astoria, New York City, March 8-9.

TECHNICAL ASSOCIATION OF PULP AND PAPER INDUSTRY, annual meeting, Commodore Hotel, New York City, Feb. 21-24.

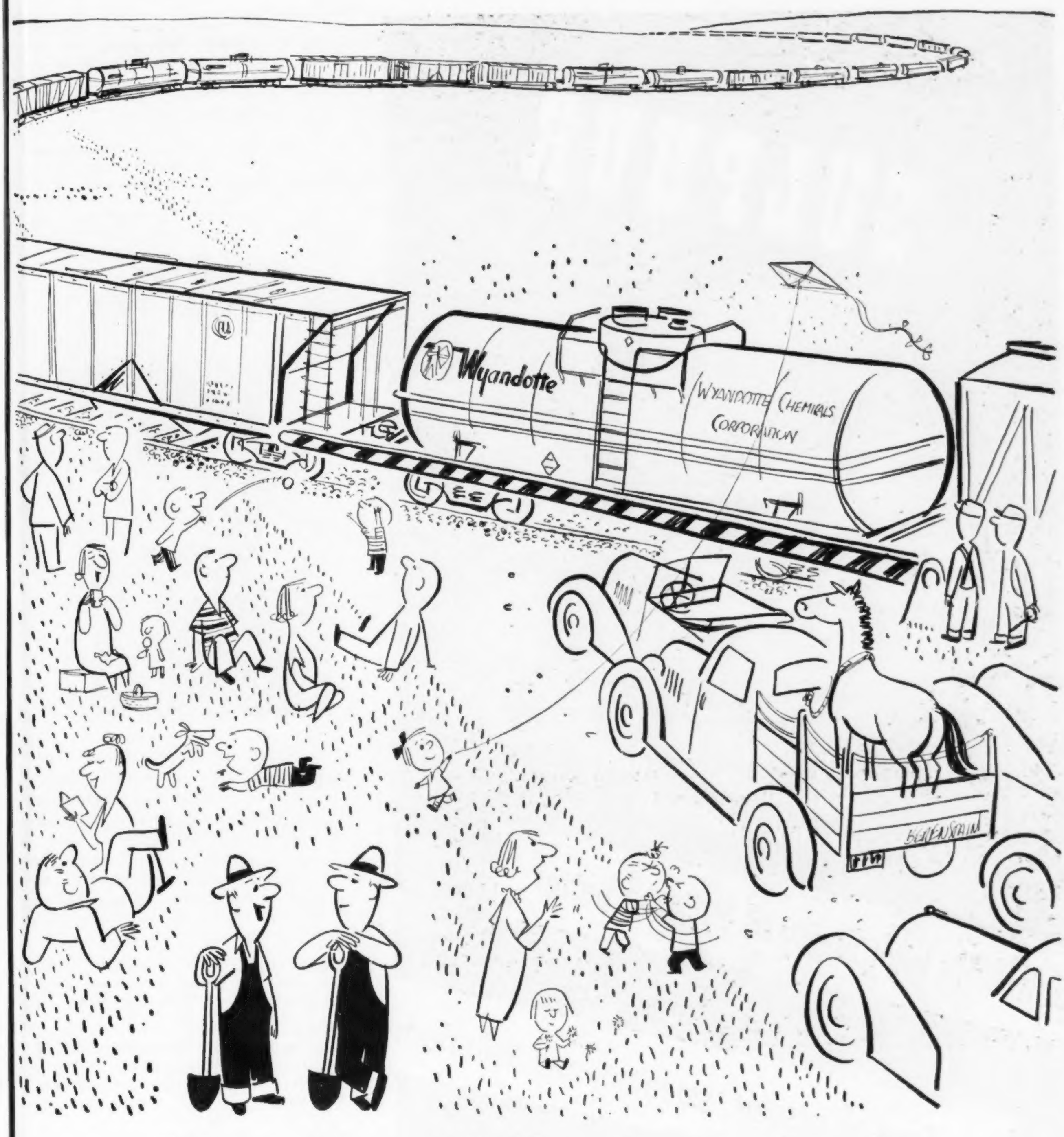
THIRD NATIONAL MATERIALS HANDLING EXPOSITION, Convention Hall, Philadelphia, Jan. 10-14.

COMPANIES

Trans-Pacific Traders of Los Angeles, California, merchant exporters specializing in the export of chemicals, has opened a New York office at 11 West 42nd Street.

Robert L. Williams is manager of the added facility, and will act as purchasing agent for export products in the New York markets. He will also be in a position to offer West Coast products to New York exporters.

Det Norske Zinkkompani A/S has engaged the services of the Engineering Division, The Davison Chemical Corp., Baltimore, Md., to design and engineer



"They've been waitin' here for seven hours"

You'll never have to wait this long for a moving train at a railroad crossing, but that's what *would* happen if the annual production of Wyandotte Chemicals Corporation were put into a single freight train. It would take more than 29,000 tank, box, dry ice and hopper cars to carry the million-and-a-quarter-ton load. Moving at 30 m.p.h., the 222-mile-long train would pass a given spot in about seven hours.

Wyandotte produces soda ash, caustic soda, chlorine and many other organic and inorganic chemicals to meet the requirements of industry. For economical and efficient unloading, each of these chemicals is shipped in the type of car required by the product and the consumer's product-handling equipment.

If your production plans call for any of the chemicals listed below, *why not ask Wyandotte?*

Wyandotte REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION

WYANDOTTE, MICHIGAN • OFFICES IN PRINCIPAL CITIES

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine • Hydrogen • Dry Ice • Glycols Ethylene Dichloride • Propylene Dichloride • Chloroethers • Aromatic Sulfonic Acid Derivatives • Other Organic and Inorganic Chemicals

part of a plant devoted to the production of superphosphate. The plant will be erected at Eitrheim pr. Odda, Norway. Det Norske Zinkkompani A/S is one of the largest manufacturers of electrolytic zinc in western Europe.

The OLIVER CHEMICAL Co., manufacturers of sanitary chemicals, disinfectants, and insecticides, has purchased a one-story brick building at 1918 Freeman Avenue, Cincinnati 14, Ohio, and has moved its office and factory to this new location.

Kube in New Ethyl Corp. Post

Harry Kube, appointed manager of the chemical sales division, a new post with the Ethyl Corp. He has been with the company for 19 years.

The BLACK HILLS CHEMICAL Co. has been opened at Rapid City, South Dakota, for alkalies, detergents, soaps, supplies and industrial chemicals. V. M. Jacobsen is manager.

AMERICAN S. & B. CORP., S. & B. CHEMICALS, has moved its offices to 65 West 36th St., New York City.

WINTHROP-STEARNS, INC., has now opened its new $100,000 warehouse and branch office at Dallas, Texas. Claude Demarest is division manager in charge. The company has also opened an office for the Special Markets and Industrial Division in Minneapolis with N. J. Stromstad as manager.

PERSONNEL

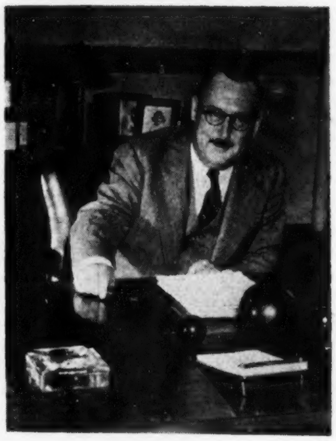
Company Officers

- At the annual organization meeting of the board of directors of VIRGINIA-CAROLINA CHEMICAL CORP. officers of the corporation were reelected and Edwin Cox and Charles E. Heinrichs were elected vice-presidents.

- George W. Ullman has been elected president of SUN CHEMICAL CORP., and A. C. Horn has been elected chairman of Sun's executive committee.

- Owen Rice has been elected vice-president in charge of commercial chemical sales of CALGON, INC., Pittsburgh.

Hagan Elects Erikson President



D. J. Erikson, elected president of Hagan Corp. and its subsidiary companies—Calgon, Inc., Hall Laboratories, Inc., and Buromin Co. He has been with the company over thirty years, and has been vice-president in charge of sales since 1939.

• George R. Prout, vice-president of the General Electric Co. and general manager of the Air Conditioning Department, has been named an assistant general manager of the G-E Nucleonics Department.

Mr. Prout will become general manager of the Nucleonics Department on January 1, succeeding Roy C. Muir, G-E vice president who returned from retirement last April to head the department. Mr. Muir will continue as a consultant.

Production

• Virden W. Wilson, Shell Chemical Co., Deer Park, Tex., has been made chief chemist in charge of the laboratories. He was formerly assistant chief technologist,

• Bertold Wolff, formerly associated with The Ore & Chemical Corp., has joined N. V. Groma Inc., New York City, as a managing director.

• Fred G. Gronemeyer has been named to the newly created post of chief engineer of the Monsanto Chemical Co.'s Organic Chemicals Division.

Mr. Gronemeyer, who for the past 16 months has been director of General Engineering, will continue to be in charge of that department until a successor has been appointed.

• Henry D. Noll, petroleum engineer, has been appointed manager of the Houdry Engineering and Technical Service Division.

In his previous activities with Houdry he has served as manager of the Project Analysis Department and as technical consultant for Houdry licensees on problems pertaining to reconversion of plants from wartime operation to peacetime production; the modernization of refinery equipment; and, the installation of new catalytic cracking equipment.

• Charles F. Gerlach has been appointed technical service manager, agricultural

chemicals, at MICHIGAN CHEMICAL CORP. In his new capacity he will coordinate the various technical activities related to the company's insecticides, fungicides and weed killers.

• Arthur W. Carpenter, manager of physical testing laboratories at the Akron plants of B. F. GOODRICH has been loaned to the government for service on the NATIONAL SECURITY RESOURCES BOARD and is in Washington for three months.

• George W. Low, Jr., has been appointed manager of the AMERICAN VISCOSE CORP.'s Sylvania division plant, which manufactures cellophane. He succeeds George J. Alles, who has been appointed as purchasing agent for the corporation.

• Robert M. Reese, long associated with Winthrop-Stearns, Inc., has become affiliated with ALEX. C. FERGUSSON CO. of Philadelphia as director of their Sanitation Division.

Sales

• Victor H. Boden has been appointed Eastern Division sales manager of CARBIDE AND CARBON CHEMICALS CORP. He joined Carbide in 1933 as an Industrial Fellow at the Mellon Institute of Industrial Research in Pittsburgh.

• Walter S. Russell, for eight years associated with Westvaco Chemical Corp. and recently Eastern District sales manager, has been named general manager, WOLLEN CHEMICAL AND SUPPLY CO., Paterson, N. J.

• Murielle H. North has joined BOCON CHEMICAL CORP. as manager in charge of advertising and public relations. Miss North was formerly associated with Roy S. Durstine, Inc.

• MODERN PLASTICS MAGAZINE has appointed Hiram C. McCann as editor and R. L. Van Boskirk as senior editor. Both have been on the editorial staff of Modern Plastics for several years, the former as associate publisher and the latter as features editor.

Research

• John H. Bower has retired as assistant chief of the Surface Chemistry Section of the BUREAU OF STANDARDS after nearly 40 years of Government service. Mr. Bower has carried out extensive research on the properties and methods of analysis of waxes, polishes, soaps, and other detergents. He also has been active in the field of standards and specifications for these materials.

• Andrew P. Massey has been appointed to the staff of the Engineering Electronics Section of the NATIONAL BUREAU OF STANDARDS, where he will head the electronics standardization group.

• Charles C. Price, head of the Department of Chemistry at the UNIVERSITY OF NOTRE DAME, has been honored for his important scientific research during World War II with a certificate of merit or appreciation from the OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT.

Dr Price, who came to Notre Dame in 1945 from the University of Illinois, has attained distinction in research in the

field of high polymer chemistry. In 1946 he received the American Chemical Society's award to the outstanding chemist under the age of 35.

• Announcement has been made of a two-year leave of absence for Edmund W. Lowe, technical director of EDWAL LABORATORIES, INC. Dr. Lowe will spend his two-year sabbatical at Purdue University, where he will hold a research fellowship in the School of Chemical & Metallurgical Engineering.

• Horace T. Herrick, one of the country's outstanding authorities on the industrial use of farm products, has retired after 22 years' service in the U. S. DEPARTMENT OF AGRICULTURE'S Bureau of Agricultural and Industrial Chemistry.

For the past two years Mr. Herrick has been special assistant to the chief of the Bureau. He has done valuable work in maintaining close cooperative relationships with manufacturers and processors who share in research results and assist in commercial tests of new products and processes developed by the Bureau's laboratories.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Of *Chemical Industries*, published monthly at Philadelphia 4, Pa., for September 24, 1948.

State of New York, County of New York, ss.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Robert L. Taylor, who, having been duly sworn according to law, deposes and says that he is the Editor and Manager of *Chemical Industries* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, MacLean-Hunter Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y.; Editor, Robert L. Taylor, 522 Fifth Avenue, New York 18, N. Y.; Managing Editor, H. C. E. Johnson, 522 Fifth Avenue, New York 18, N. Y.; Business Manager, W. Alec Jordan, 522 Fifth Avenue, New York 18, N. Y.

2. That the owner is: Maclean-Hunter Publishing Corporation, 522 Fifth Avenue, N. Y. The stockholders of the Maclean-Hunter Publishing Corporation are: E. R. Gauley, 808 Junior Terrace, Chicago 13; J. L. Frazier, 2043 Orrington Ave., Evanston, Illinois; Col. J. M. Maclean, 7 Austin Terrace, Toronto, Ontario; Horace T. Hunter, 120 Inglewood Drive, Toronto; Maclean-Hunter Pub. Co., Ltd., 481 University Avenue, Toronto.

3. That the known bondholders, mortgagees, and other security holders, owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

ROBERT L. TAYLOR,
Editor and Manager.

Sworn to and subscribed before me this 27th day of September, 1948. Peter J. Michel, Notary Public, N. Y. Co. Clk. #877, Reg. #594-M-9. Commission expires March 30, 1949.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

DDT Resistant Flies On Increase

There is now definite evidence that house flies are developing resistance to DDT in many parts of this country and elsewhere in the world, according to entomologists of the U. S. Department of Agriculture. The fact that successive generations of these flies, when subjected to periodic applications of DDT under laboratory conditions, could develop strains that require increasingly greater amounts of the chemical to kill them had previously been determined.

Reports received by the Bureau of Entomology and Plant Quarantine early this summer indicated that while DDT was giving satisfactory control of house flies generally, this insecticide was failing to control the pest satisfactorily in several areas of the United States. By September, reports from more than 25 states indicated that DDT was failing to control house flies in isolated areas. Health agencies in Egypt and Greece have reported a similar situation. Federal entomologists collected wild flies from dairies in the vicinity of Orlando, Florida, where DDT was first tested in this country for fly control as early as 1943. Preliminary results of tests with these and with certain other strains of house flies collected in various parts of the country have shown that there are strains of flies which now require a longer period of contact with DDT to kill them. This indicates development of some resistance by house flies to the insecticide under field conditions.

The entomologists are not ready to say that resistance of the flies is the most important factor explaining DDT failures this year. This factor must, however, be watched and studied further.

Texaco Enters Anti-Freeze Market

With the marketing of its ethylene glycol as an anti-freeze under the trade name Texaco PT, The Texas Co. is entering what is for it an entirely new market. Large-scale production has begun, and the permanent type anti-freeze will be made available this fall on a national basis through Texaco dealers.

Texaco's decision to market an anti-freeze was made following the organization of the Jefferson Chemical Co., Port Neches, Tex., owned jointly by The Texas Co. and American Cyanamid Co. Jefferson will supply the ethylene glycol, which is compounded with rust, foam, and corrosion inhibitors developed after extensive tests.

Although the new source of permanent type anti-freeze should alleviate supply conditions, it is not expected to satisfy demand completely. The 1948-1949 demand for all types of anti-freeze is estimated at 80 million gallons, of which 27 million gallons are glycol-based. This is in sharp contrast to the 8 million gallons of glycol used in 1936. Estimates of future requirements are even higher, with a 92 million gallon overall demand seen in five years. Half of this is expected to be glycol.

O-Dichlorobenzene in Small Quantities

Orthodichlorobenzene technical has been made available in quantities as small as five gallons by Monsanto Chemical Co. This chemical has long been a car lot item in the industry.

The move was made to accommodate the increased number of small volume consumers of this versatile solvent. Unusual characteristic of orthodichlorobenzene is its combination of high solvent power and low toxicity with low flammability.

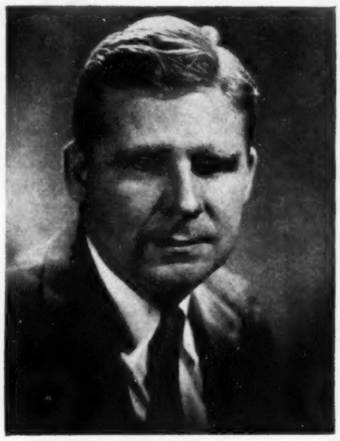
In informal tests, rags soaked in the chemical would barely support combustion while flame was held to them, and snuffed out when it was removed. Blends of gasoline or kerosene and orthodichlorobenzene are less-hazardous cleaning agents in machine shops, die works, garages and tool rooms. It is also reported to be an excellent paint brush cleaner and "spotting" agent.

Sterling Drug Opens Myerstown Plant

James Hill, Jr., president of Sterling drug Inc., recently officially opened the new Myerstown, Pa. plant of its subsidiary companies, Winthrop-Stearns Inc., and the George A. Breon Co. With the opening taking place during "Pennsylvania Week", state, county, and borough officials were invited to participate, and residents of Myerstown attended an "Open House" at the plant. The plant manufactures liquids, powders and ointments for the two companies.

Nearly a year has been required to get the plant in operation. Purchased with the interior unfinished from the Burry Biscuit Corp., Elizabeth, N. J., the interior has now been subdivided by sanitary glazed tile walls into 16 departments designed for the production, control, finishing and storage of medicinal preparations. The main building, one of two on the 30-acre site, is of two stories, containing 75,000 square feet, adapted for continuous straight-line operation.

Locke Joins Arnold, Hoffman & Co.



R. M. Locke, appointed technical director of the dye department of Arnold, Hoffman & Co., Inc. He has been vice-president of Ross-Smith Corp., in charge of photographic printing on fabrics.

Hilo Varnish Offers New Resistant Coating

Hilo Varnish Corp., Brooklyn, N. Y., has introduced an alkali-resistant coating that shows no film break-down or loss of gloss after one hundred hours in standard test detergent soap solution at 160-165° F.

Hilo No. 2463 alkali-resistant white enamel is said to be ideally suited for use on washing machines, kitchen equipment, bathroom fixtures and accessories and many other products subject to contact with soap and detergents used in washing. It may be used on both metal and wood. It requires baking at 300° F. for 30 minutes or 250° F. for one hour.

Chigger-Proof Clothing Withstands Laundering

Chigger-proof clothing that will stay that way for the life of the garment is a definite possibility as the result of U. S. Department of Agriculture research that has continued since the end of the war. Two organic compounds which can be used to impregnate cloth from which garments are made have remained deadly to chiggers after seven launderings. This would ordinarly cover most of the life of working clothes, hunting and outing garments and military uniforms for which chigger protection is most needed. The most promising compounds are listed as phenyl carbonate and x, x'-dichloro-

"I'm going over to Hardesty"

More and more fatty acid users are "going over to Hardesty." It's becoming a *standard* practice because Hardesty has such *standard* products—fatty acids of such uniformity that manufacturers know *exactly* what they're getting. Hardesty's delivery dates are as reliable as their products. When Hardesty promises a shipment, it arrives on schedule . . . and *ready to go to work.* That means *a lot.* A bad shipment, an inaccurately filled order, can cost losses in four figures—lost manpower hours and lost customers for end-products.

For fatty acids with "pedigrees," join the hundreds of purchasing agents who are "going over to Hardesty"—W. C. Hardesty, 41 East 42nd Street, New York 17.

Red Oil Glycerine Stearic Acid
White Oleine Stearine Pitch
Hydrogenated Fatty Acids
Animal and Vegetable Distilled
Fatty Acids

HARDESTY PRODUCTS ARE INDUSTRY'S KEYSTONE

W. C. Hardesty Company

41 EAST 42nd ST., NEW YORK 17

FACTORIES: DOVER, OHIO
LOS ANGELES, CALIF. • TORONTO, CAN.

diphenyl ether. Only research results have been announced and the Department does not know of any commercial application as yet.

During the war, research to combat the South Pacific scrub typhus mite that is a close relative of the American chigger led to dipping uniforms in a 5 percent emulsion of dimethyl phthalate and hanging them to dry. This would protect a soldier from the mites for up to a month —or until the uniform was laundered. Further work showed that benzil and benzyl benzoate would stand from three to five washings. V-J Day came before these treatments got to the Pacific jungles. Continued investigations have resulted in the still more durable compounds that are effective against chiggers and do not cause bodily discomfort.

Improved Soot Cleaner

G. N. Coughlan Co., West Orange, N. J., has begun shipments of its new formulation for Powder Chimney Sweep to distributors after test-marketing the product in Minnesota. The new powder is replacing a product that has been nationally distributed for six years. Advertising on network and local radio stations, in consumer magazines, and newspapers will be used to spark sales through hardware and department stores.

The material when added to a red-hot furnace, destroys soot and carbon or wood tars in the fire box and chimney. It is available in 1-lb. and 3-lb. packages.

Two Companies Making New Drug

Sumner Chemical Co., Zeeland, Mich., and Hexagon Laboratories, Inc., Bronx, N. Y., are offering under the names "Toloxyn" and "Myanesin", respectively, ortho-cresol alpha-glyceryl ether which is still in the experimental stage therapeutically. British investigators have been working with the drug for several years as an "anesthetic potentiating" agent especially for its ability to produce muscular relaxation under relatively light general anesthesia. It appears to be the most active and safest of a number of alpha-glyceryl ethers showing this property.

Hexagon Laboratories is also now in full scale production of para-amino-salicylic acid, the chemical which has found use in the treatment of tuberculosis in conjunction with streptomycin.

Fair Trade Law Applies To War Surplus

The rights sanctioned by fair trade laws extend to the resale of war surplus trademarked commodities purchased from the War Assets Administration, according to a decision by Judge Thomas M. Foley of the Superior Court of California.

Judge Foley's ruling came as he granted an injunction to restrain Benatar's Cut Rate Stores, San Francisco, from further violation, in their sale of Dr. Lyon's Tooth Powder, of the fair trade contract of Sterling Drug Inc.

The drug company had instituted the action against Benatar's to restrain the latter's sale of Dr. Lyon's Tooth Powder at prices below the minimum retail prices stipulated in the company's fair trade contracts in California. Benatar's had claimed that the material it was selling was war surplus merchandise and that such merchandise did not come within the fair trade contract.

Monsanto Offers Wax Extenders

Many types of scarcer and more expensive wax used in fine automobile, wood, leather and linoleum polishes, can be extended or replaced by chlorinated biphenyl and chlorinated polyphenyls, sold under the Monsanto Chemical Co. trademark Aroclor. In selected blends they are said to satisfactorily extend or substitute waxes and conform with the natural products.

An improvement in quality and cost over earlier attempts to replace such wax as carnauba wax, Aroclors make possible a variety of uniform blends which in hardness, texture, melting point and performance are similar to the natural wax.

CHEMICAL MARKETS

Downward Trend Over For Essential Oils

A new market situation has been noted recently in the apparent reversal of a prolonged downward trend in the price of essential oils. Some items have shown resistance to further decreases, and others have actually pointed upwards. Although domestic demand has shown considerable improvement since the early part of the year, currency difficulties preclude any appreciable export demand.

One of the largest essential oil houses reports that a true reflection of the situation with respect to many imported oils would be a bullish market, but that the picture here is obscured by foreign eagerness for dollars. Foreign suppliers are willing to sacrifice merchandise regardless of cost to secure dollar credits. This results in exhaustion of spot stocks and discouragement of further production. It points out that in such an unhealthy atmosphere, return of a normal consumer demand may mean a sudden rapid trend upward in many markets.

Synthetic Detergent Data Shows Upswing

In an effort to provide needed authoritative data on synthetic detergent production, the American Soap and Glycerine Producers report that sales of synthetic detergents by 15 manufacturers for the first half of 1948 totaled 166 million pounds valued at $51 million. Second quarter sales were 97 million pounds, 40 percent over those during the first quarter, while the dollar value of sales amounted to $28 million, a gain of 22 percent.

Tung Oil Promises Much for South

The increasing production of tung oil by the southern tung belt of Louisiana, Mississippi, and Florida promises to make this relatively new industry a rich one. Output has increased from 8,750 tons of tung nuts, valued at about $.75 million in 1941, to 47,300 tons worth about $4.7 million in 1946. The largest crop in the history of this section is expected in 1948. With both private and government interests experimenting on the agriculture and chemistry of tung, the industry should expand further.

Only one variety of the tung tree is grown in the United States, and the oil content is about 23 to 27 percent of the weight of the nut. The oil, in no way inferior to that used in Oriental lacquers for centuries, is superior to the lighter weight oil formerly supplied by China and being grown also in Argentina. If Chinese production of tung were to attain the stature of pre-war years, the better American processing methods should keep this country a leading source. Besides China, to which they are native, and Argentina, we are the only country to raise tung trees successfully on a commercial basis.

The paint and varnish industries customarily consume about 80 percent of the oil, because it is fast-drying and creates a water-proof, acid-resistant, alkali-resistant paint or varnish with good weathering properties.

British Paint Industry Plans Cooperative Export

According to British trade reports, some 150 paint manufacturers in Great Britain plan to participate in a cooperative marketing effort for handling export trade. Common formulas and standard colors and packing would be utilized. The president of the Paint Manufacturers and Allied Trades Association, which is formulating the new project, states that the Board of Trade has agreed to allocate scarce raw materials to make possible production for export markets.

Under the proposed plan, producers would be divided into different categories, with certain manufacturers making one quality of paint of one color for the whole group. A separate organization will handle marketing on behalf of producers engaged in the plan.

Developments in the new venture will be watched with interest, not only because of the willingness of companies to surrender their individualities, but because of the possible effects it will have on export markets. This is the first time the cooperative method of trading has been employed by individual British firms in foreign trade, and if successful, may extend to other chemicals.

Record Consumption of Industrial Explosives

Consumption of industrial explosives in the United States reached a new high record of 651,390,937 pounds in 1947, according to the Bureau of Mines. This record total, which reflects the high levels of activity in the consuming industries, was 12 percent greater than the former peak annual consumption in 1917.

Sales of permissible explosives and of high explosives other than permissibles each advanced to record totals in 1947

which were respectively 22 and 19 percent greater than the former records in 1946. The gain in use of permissibles resulted from the high level of activity in bituminous-coal mining. Consumption of high explosives other than permissibles in 1947 gained sharply over 1946 in all uses; the gain of largest proportion was in railway and other construction uses for which consumption increased 30 percent over 1946. Sales of black blasting powder in 1947 were virtually unchanged from 1946. Although consumption of granular black blasting powder fell 27 percent below 1946 this decline was compensated by a 14 percent increase in sales of pellet black blasting powder in 1947.

Consumption of liquid oxygen explosives totaled 16,561,539 pounds of which all was used in bituminous-coal strip mines. These data which are included for the first time in the survey of explosives consumption are expressed as the weight of the fully saturated cartridges at the time of removal from the soaking box.

Sizable quantities of surplus explosives from the war were sold during the fiscal year ended June 30, 1948 by the War Assets Administration. From the meager data available it appears that about 15,350,000 pounds of block TNT and 264,000 pounds of flake and crystal TNT were sold during fiscal 1948.

Market Review

A sudden reduction in the price of fermentation butyl products provided the solvents market with a record downward slide as the fermentation products involved sold for the same as synthetics. Butyl alcohol and butyl acetate were slashed 13½¢ per pound to 18¢ in tankcars, while spot prices on drums in carload lots and less than carload lots became 19½¢ and 20¢ respectively. The break, due to the government's releasing large supplies of potatoes at low price to processors, resulted in an easier tone in all derivatives of butanol, and generally weakened the solvents market.

Throughout the month the improved supply position of both caustic soda and soda ash was noted, but some producers indicated that they were a little behind on some orders in certain areas. The resale market price of caustic was gradually heading down, with the 5¼¢ per pound figure expected to fall below 5¢, a low not reached since the war. Light soda ash was at 2-2¼¢ per pound at resale, with buyer interest off. An indication of how conditions had changed from a few months ago was the rumor that producers were actively seeking to move additional tonnage among domestic consumers.

Although the output of synthetic glycerin was expected to have some effect, except for a few reported "scare" sales at bargain prices, the market for the natural material remained fairly steady. A price of 27¢ a pound was being asked for soap lye glycerin, and despite no record of business at that figure, it was felt that the demand for the refined grade would force refiners to meet it.

The difficult situation that has existed in chromic acid continued with no improvement. There was no letup in demand from the plating industry, and the supply position of such chemicals as chromic acid and nickel was poor.

Another industry feeling one of the worst pinches in its history was the paint manufacturers, as there appeared to be no prospect for improvement in the lead pigments supply position. One of the few remaining areas experiencing black market prices was the lead market where premiums of as much as four cents a pound above the regular price were being asked.

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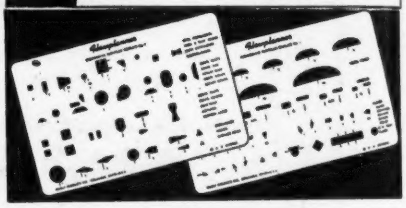

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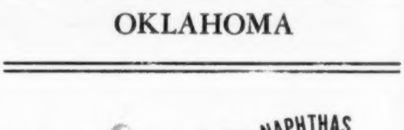

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Acrylate and Methacrylate Vapor Pressures

(*Continued from page 844*)

logarithm of the pressure with the reciprocal of the absolute temperature:

$$\log p = A - B/T$$

and is based on data given by Rehberg and Fisher[2].

The use of the chart, which was constructed by methods previously described[1], is illustrated as follows: What are the vapor pressures of n-amyl acrylate and n-amyl methacrylate at 100° C? The key on the chart states that circles and plus signs refer to acrylates and methacrylates, respectively. Connect 100 on the t scale with circle No. 5 for n-amyl acrylate and read the vapor pressure on the p scale as 86 mm. of mercury. Connect 100 on the t scale with plus sign No. 5 for n-amyl methacrylate and read the vapor pressure on the p scale as 53 mm. of mercury.

The boiling points of any of the compounds can be found by connecting 760 mm. on the p scale with the proper points and reading the desired temperatures on the t scale.

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[1] Davis, D. S., "Empirical Equations and Nomography," Chapt. IX, New York, McGraw-Hill Book Co., 1943.

[2] Rehberg, C. E. and Fisher, C. H., Ind. Eng. Chem., *40*, 1429 (1948).

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(*Continued from page 832*)

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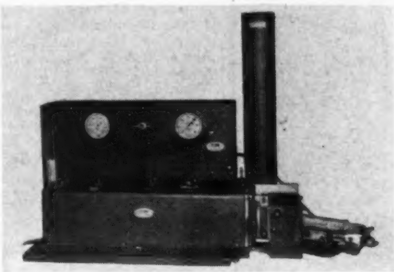
Small samples are atomized and introduced at a uniform rate into a very hot oxygen and gas flame exciting the spectral



emission lines of the elements. The spectrophotometer isolates these lines and measures their intensities relative to a blank or standard.

The Beckman flame spectrophotometer features unusually high resolving power and photometric accuracy thus permitting versatility and sensitivity greater than 0.01 ppm. Even traces as small as a few parts per billion can be easily detected.

• LE103 A new portable *Geiger-Muller survey meter* has been developed by Precision Radiation Instruments, Inc. In addition to portability the #101 survey meter has the advantage of an exclusive plug-in unit incorporating all the major components, and can be replaced almost as simply as replacing an ordinary vacuum tube. Extra plug-in units can be carried in stock for quick replacements as needed.

• LE104 A new *Geiger Counter,* designed for detection of soft ionizing radiation like that from C^{14} or S^{35}, is available from Nuclear Instrument and Chemical Corp. The outstanding feature is its use of "Q-Gas." "Q-Gas" is a scientifically formulated mixture of gases which permits operation of the Geiger Counter at atmospheric pressure over a wide temperature range, with an anode potential of only 1450 volts. The pulse output will operate a scaling unit with an input sensitivity of .25 volt.

The "Q-Gas" Geiger Counter has an unusually wide range of application. It is used for the detection of alpha particles and very soft beta radiation. Because of the high gas pressure (atmospheric), the efficiency for gamma radiation is greater than that of low pressure type counters. Hard beta emitters are also efficiently counted because the Q-Gas counter detects particles emitted with energies at the low end of the energy distribution curve.

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INDEX of ADVERTISERS

"WE"—EDITORIALLY SPEAKING

WHEN THE MEMBERS of the Association of Consulting Chemists and Chemical Engineers held their annual dinner meeting recently, an excellent example of the chemist's art—molded plastic dinnerware—was on the table before them. Some of the more research-minded members had to be restrained by moral suasion from putting cigarette lighters to the plates to determine their composition.

WE HAD AN AMUSING experience last week on the street corner just outside our office building. While waiting for the Fifth Avenue bus, we noticed a well-dressed, silvery-templed man, also waiting, with a copy of *The Daily Worker* under his arm. We scrutinized the paper; then looked at the man. He deliberately unfolded his papers, tucked his *Worker* inside a *New York Times,* and silently stole away.

AT NEW YORK'S Golden Jubilee Exposition they bombarded dimes with neutrons, transmuting the silver to cadmium. Let's see now: silver is quoted at 75c an ounce, cadmium at $1.90 a pound, or roughly 12c an ounce. Those boys aren't going to get rich.

OUR EYE WAS CAUGHT by a classified ad in the *Wall Street Journal:* "Wanted: Teller. Tall young man preferred." Tsk, tsk! Sounds to us like spatial discrimination.

CHEMISTS aren't so smart after all. The New York subway system, we were just reading, uses an automatic money counter to tote up its take of dimes. One of the essential parts of the machine is a metal plate which must be kept slippery with wax. They tried all sorts of waxes, but none of them performed satisfactorily until one of the more pious and ingenious workers brought in a votive candle. Now the system buys the candles for greasing the plates, bringing the temple, as it were, to the money-changers.

AH, THESE WESTERNERS! A recent communication tells us of one of the contracts for the Hungry Horse Dam across the Flathead River near Devil's Elbow, Montana. It appears to us that Western geography must have been invented by Li'l Abner. How pale by comparison are Linden, Cranford, and Scarsdale!

THE *Southern Chemist* tells us about Dr. E. E. Litkenhous, head of the department of chemical engineering at Vanderbilt University. He has a practically foolproof system of picking football winners, scoring a higher percentage of right guesses than Grantland Rice, Paul Gallico, or any of the news services.

THIS IS THE END! Now it comes out that cows suffering from a copper deficiency turn purple. If you never hope to see one, you better not go down to the Florida Everglades, where one turned up recently. (P. S.: We'd rather see than be one.)

ONE OF THE LATEST socialistic measures in Great Britain is aimed to discourage the use of trade names on proprietary drugs, substituting the chemical name instead. Can you imagine your favorite disc jockey purring, "Now why don't you just go down to your corner drug store and ask for a large, economy bottle of (1)-α-hydroxy-β-methylamino-3-hydroxyethylbenzene hydrochloride"?

VITAMIN K_5 is hailed as swell stuff to prevent alcoholic fermentation of fruit juices. "A loaf of bread, a jug of K_5-fortified grape juice and thou . . ."

A POEM in the *New York World-Telegram* in regard to Air Reduction Co. poses a question that we, too, can't answer:

"Here's a question I'm getting used to—
What in thunder's the air reduced to?"

HERE'S A SENTENCE from some anti-fertilizer propaganda that the rock products industry should look into: "It was a sorry sight—63 acres of hard-packed, unyielding soil, gradually turning to concrete."

FIFTEEN YEARS AGO

(From Our Files of Nov. 1933)

Chemical Alliance, Inc., and NRA officials are deadlocked over the "merit clause," modifying the collective bargaining provisions, in the chemical code. Due to fundamental differences of opinion over the open shop, it is very uncertain when the basic code will be ready. However, presidential approval of codes has moved much faster in the past two weeks—both the fertilizer and paint codes have been approved.

Annual issuance of the German nitrogen syndicate's new price schedule has been delayed pending government investigation of fair prices to be charged the farmer. This is the first time that the German government has exercised direct authority in supervising prices in the nitrogen industry.

New Chemical Industry Medal of the American Section of the Society of Chemical Industry has been presented to James G. Vail, Philadelphia Quartz vice-president. The new medal is to be awarded annually to a person who has made valuable application of chemical research to industry. The award went to Mr. Vail for his work on sodium silicates.

American Cyanamid Co. has acquired the Filtration Equipment Corp. which owns the Laughlin equipment and process of sewage treatment by chemical-mechanical methods. The corporation will operate as a separate division of the parent company.

Extensive experiments have proved that lactates possess the property of direct nickeling of zinc.

THIRTY YEARS AGO

(From Our Files of Nov. 1918)

The Anaconda Copper Mining Co. is expected to enter into the field of phosphate manufacture.

A chemical process for transforming wood pulp into cellulose from which silk threads are made holds promise of a rising industry in the United States.

Federal Trade Board members are discussing re-sale price fixing.

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Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

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U. S. Patents from Official Gazette—Vol. 611, Nos. 4, 5; Vol. 612, Nos. 1, 2, 3, 4; Vol. 613, No. 1 (June 22-Aug. 3) Canadian Patents Granted and Published Aug. 10-31

**Specialties*

Canadian

Adhesive composition comprising of petrolatum, a compatible terpene hydrocarbon condensation resin and an aluminum soap. No. 449,391. Lothian M. Burgess and Gene Abson to H. P. Smith Paper Co.

A composition of matter which, upon admixture with water will at room temperatures set to a water-insoluble condition comprising a water-soluble melamine formaldehyde condensation product and a hydrated alkaline earth oxide. No. 449,616. John K. Wise to Canadian Gypsum, Ltd.

Printing ink composition non-drying at ordinary temperatures and dries instantly on heating of the printed matter by evaporation resulting gelation without passing through the stage of tackiness, consisting of coloring matter dispersed in an organic viscous vehicle consisting of from 5-30 per cent by weight of ethyl cellulose and from 40 to 60 per cent by weight of 2-ethylhexyl alcohol. No. 449,622. Herbert J. Wolfe and Paul W. Greubel to American Can Co.

New cement product formed by combining dry powdered cement with a non-aqueous organic liquid to form a hard firm cement matrix. No. 449,770. James A. Sourwine.

Rust resisting coating on an iron wire of red iron oxide, fibrous magnesium silicate, litharge, aluminum stearate, congo-linseed oil varnish, and varnish maker's and printer's naphtha. No. 449,782. Willis E. Boak to The American Steel and Wire Co. of New Jersey.

In the production of bright wire method of passing the wire stock through a dry powder-like mixture containing zinc sulphide and calcium stearate. No. 449,783. Flint Cummings Elder to The American Steel and Wire Co. of New Jersey.

Treating a steam system with the water-soluble salt of an amine. No. 449,837. George B. Hatch to Hall Laboratories, Inc.

Rubber to metal adhesive, a mixture of rubber, an alkali metal alum, phosphorus pentoxide and free sulphuric acid. No. 450,124. Roy M. Vance and Clement A. Damicone to The General Tire & Rubber Co.

Pressure sensitive adhesive comprising a condensation product of castor oil with a maleic half ester of a monohydric alcohol and a compatible cohesive agent. No. 450,128. Rudolf J. Priepke, John H. Emigh and C. Olson Pike to Johnson & Johnson, Ltd.

Antioxidant for an organic substance which tends to deteriorate by absorption of oxygen from the air which comprises incorporating therein a dihydro dihydroxy naphthalene. No. 450,280. Philip Timothy Paul to Dominion Rubber Co., Ltd.

Antioxidant which comprises a para-substituted arylamino 2,2,4-trialkyl dihydroquinoline. No. 450,282. Philip Timothy Paul to Dominion Rubber Co.

Dispersing agent which comprises reacting in the presence of an aluminum borate catalyst a resin containing abietic acid with fuming sulphuric acid in a reaction medium of liquid sulphur dioxide and an inert water immiscible organic solvent. No. 450,303. Douglas Fronmuller and Berwyn B. Thomas to The Institute of Paper Chemistry.

**Textiles*

Process for the manufacture of textile fabric capable of being dissolved by water by impregnating a cellulose fabric with a caustic alkali solution. No. 2,439,865. Robert Pierce Roberts to Celanese Corporation of America.

Production of viscose rayon. No. 2,440,057. Frederick R. Millhiser to E. I. du Pont de Nemours & Company.

As a spinning solution for use in the production of low luster filaments, a viscose solution containing a delusterant and a dispersing agent. No. 2,440,094. William O. Israel to Industrial Rayon Corporation.

Obtaining ramie fibre from green ramie stems by the action of steam, drying, and crushing to separate the fibres. No. 2,440,562. Mark Michael Wise.

In the treatment of undrawn synthetic plastic fibers a conditioning compound comprising shellac, glycerin, and a pitch solution made up of about 33% pitch and 67% methanol. No. 2,441,209. Herbert E. Rose to All American Aviation, Inc.

Treating organic fabric having fibers which are greasy by applying a latex having as the dispersed phase rubber-like copolymer of aliphatic conjugated C_5 diolefine material selected from the group consisting of isoprene and piperylene. No. 2,441,523. Alger L. Ward to United Gas Improvement Company.

Coated fabric having a coating comprising a polyvinyl butyraldehyde acetal resin. No. 2,441,542. Robert R. Lawrence to Monsanto Chemical Company.

Improving textile materials without loss of tensile strength and abrasion resistance, by wetting with an aqueous solution of a water-soluble aliphatic aldehyde type compound, in the absence of an acidic catalyst, drying, thereafter exposing them to steam in the presence of an acid. No. 2,441,859. Mark Weisberg, Archibald S. Stevenson and Leo Beer to Alrose Chemical Co.

In the manufacture of viscose yarn the step which comprises spinning the viscose filaments in the presence of a dissolved, surface-active polymerized alkylene oxide. No. 2,442,331. Arthur Cresswell to North American Rayon Corp.

Treating a textile material to provide a firmly adhering coating by applying a solution of unsubstituted cellulose dissolved in an aqueous alkali metal zincate solution, contacting the textile material and applied solution with an agent causing precipitation of cellulose from the said solution upon the fabric. No. 2,442,973. Sidney M. Edelstein.

Treatment of textile fibers with a colloidal aqueous solution of silica. No. 2,443,512. Donald H. Powers and William J. Harrison to Monsanto Chemical Co.

Canadian

Inhibiting the wash-shrinkage of cotton fabric by treating the stretched fabric with an aqueous solution made from urea, zinc oxide and alkali metal hydroxide. No. 449,551. Charles L. Mantell and Oscar K. Heim to United Merchants & Manufacturers, Inc.

Inhibiting the wash shrinkage of cotton fabric by treating said fabric with an aqueous solution made from urea, stannic oxide and alkali metal hydroxide. No. 449,552. Charles L. Mantell and Oscar K. Heim to United Merchants & Manufacturers, Inc.

Inhibiting the wash shrinkage of regenerated cellulose fabric by treating said fabric with an aqueous solution made from urea, zinc oxide and alkali metal hydroxide. No. 449,553. Charles L. Mantell and Theodore J. Dabrowski to United Merchants & Manufacturers, Inc.

Inhibiting the wash shrinkage of regenerated cellulose fabric by treating with an aqueous solution made from urea, stannic oxide, and alkali metal hydroxide. No. 449,554. Charles L. Mantell and Theodore L. Dabrowski to United Merchants & Manufacturers, Inc.

Aqueous solution for treating rayon made from alkali metal hydroxide, urea and zinc oxide. No. 449,555. Charles L. Mantell to United Merchants & Manufacturers, Inc.

Forming textile fibres from a vinyl resin substantially identical with a resin resulting from the conjoint polymerization of a vinyl halide with a vinyl ester of an aliphatic acid. No. 449,641. Edward W. Rugeley, Theophilus A. Feild, Jr., and John F. Conlon to Carbide and Carbon Chemicals, Ltd.

Molecularly oriented fibre which comprises a cold-drawn copolymer of (1) acrylonitrile, (2) ethyl acrylate and (3) ethyl methacrylate. No. 449,790. Gaetano F. D'Alelio to Canadian General Electric Co.

Conditioning staple fibres with the reaction product of a mixture of a long chain higher fatty acid, a vegetable oil and mineral oil with oleum, having added thereto a penetrating agent and neutralized with alkali and hydroxy-alkyl amine. No. 449,890. Fred J. Schiessler to Camille Dreyfus.

Production of staple fibre textile materials of improved textile processing characteristics by applying to a mineral oil lubricated, continuous filament textile material a substantially non-aqueous conditioning agent comprising the product formed by reacting a mixture of a mineral oil, a vegetable oil, a higher fatty acid and oleum. No. 449,891. Harmon Howorth and Laurence C. Holt to Camille Dreyfus.

**Water, Sewage and Sanitation*

Purification of raw water from colloidal humic substances, comprising introduction of air into the water, addition of water soluble salt with trivalent positive ion of one of the metals aluminum, iron and chromium. No. 2,440,514. Adolf Magnus Rupert Karlstrom.

Treating sewage by anaerobically digestion. No. 2,442,241. John E. Koruzo and Kathryn J. Mulvaney.

Sewage treatment in a trickling filter comprising the steps of normally maintaining biological growth in the filter by dosage of sewage for a period of about thirty to forty-five minutes, whereby the sewage is purified to a high degree while the growth becomes more anaerobic, and periodically reconditioning by increased dosage of sewage. No. 2,442,432. Frank D. Prager to Graver Tank & Mfg. Co.

Canadian

Treating water for use in a boiler which comprises passing a solution of sodium carbonate through a potassium base exchanger, and mixing the effluent with water for use in a boiler. No. 449,353. George W. Smith to Hall Laboratories, Inc.

Conditioning alkaline boiler water by incorporating a water soluble heavy metal salt, colloidal silica to form a silica-heavy metal oxide hydrosol and incorporating a compound capable of forming carboxylic anions. No. 449,644. Lewis O. Gunderson to Dearborn Chemical Co.

Agricultural

Composition for destroying weeds comprising a carrier material and a compound selected from the group consisting of 2,4,5-trichlorophenylacetic acid and its salts. No. 2,444,905. Wilfred Archibald Sexton to Imperial Chemical Industries, Ltd.

Biochemical

Therapeutically active penicillin material from fermentation liquors by the propagation of Penicillium molds in a culture liquor while subjecting to subsurface aeration. No. 2,443,825. Harold G. Johnson to Commercial Solvents Corp.

Producing antibiotic substance. No. 2,443,962. Geoffrey W. Rake, Oskar Wintersteiner, Harold B. MacPhillamy and Clara M. McKee to E. R. Squibb & Sons.

* *U. S. Patents from Vol. 609, Nos. 3, 4. Vol. 610, Nos. 1, 2, 3, 4. Vol. 611, Nos. 1, 2, 3. Canadian from June 22-August 3.*

Production of penicillin. No. 2,443,989. Andrew J. Moyer to U. S. A. as represented by the Secretary of Agriculture.
Treatment of corn steepwater for the preparation therefrom of a nutrient material for penicillin production. No. 2,444,176. McCalip J. Thomas and Roy F. Larson to A. E. Staley Mfg. Co.
Production of penicillin. No. 2,445,748. Milislav Demerac to U. S. A. represented by Administrator, Civilian Production Administration.
Complex salts of streptomycin. No. 2,446,102. Robert L. Peck to Merck & Co., Inc.

Cellulose

Light-diffusing cellulose acetate compositions. No. 2,443,918. Joseph Edouard Gustave Lahousse and Albert Renouprez to Societe Des Usines Chimiques Rhone-Puolenc.
Cellulosic solutions. No. 2,444,022. Aart Buurman to American Enka Corp.
Freeze-drying regenerated cellulose. No. 2,444,124. Frederick C. Wedler to American Viscose Corp.
Plasticized ethyl cellulose composition. No. 2,445,084. Chessie E. Rehburg, William C. Mast and Charles H. Fisher to U. S. A. as represented by Secretary of Agriculture.
Plasticized composition containing a cellulose ether and a polyacrylic acid ester. No. 2,445,085. Chessie E. Rehberg, William C. Mast and Charles H. Fisher to U. S. A., represented by Sec'y. of Agriculture.
Coated granules of a dry water-soluble salt of carboxymethyl cellulose. No. 2,445,226. Manfred Landers to Lanco Products Corp.
Regenerated cellulose films from viscose. No. 2,445,333. James Burton Nichols to E. I. du Pont de Nemours & Co.
Stabilization of cellulose ethers. No. 2,445,374. Peter Van Wyck to Hercules Powder Co.
Plastic composition composed of a cellulose compound and an indanol ester. No. 2,445,642. Frank J. Soday to United Gas Improvement Co.

Canadian

Organic solvent-soluble beta-chloroethoxymethyl-cellulose acetate. No. 450,550. William James Burke to Canadian Industries, Ltd.
Preparing films of regenerated cellulose from viscose which comprises extruding viscose on a support to form a viscose film, drying the film to a water content of less than 45% by weight before the film has lost its solubility in water, said drying being accomplished by subjecting the film to the action of a stream of inert gas moving at a speed of at least 400 feet per minute relative to the film. No. 450,554. James Burton Nichols to Canadian Industries, Ltd.

Ceramics

Treating glass wool. No. 2,444,347. Herbert H. Greger and Raymond F. Remler to Briggs Filtration Co.
Refractory article. No. 2,444,361. Harry W. McQuaid to Republic Steel Corp.

Coatings

Coating composition of a drying oil, a phenol-formaldehyde resin, and a solvent. No. 2,445,637. Alfred L. Rummelsburg to Hercules Powder Co.
Coating composition comprising a drying oil and a hydrocarbon resin polymer. No. 2,445,643. Frank J. Soday to United Gas Improvement Co.
Coating composition comprising a drying oil and a hydrocarbon resin polymer. No. 2,445,644. Frank J. Soday to United Gas Improvement Co.

Dyes, Pigments

Azo dye compositions stabilized with unsaturated carboxylic acids or salts. No. 23,016. Swanie S. Rossander and Chiles E. Sparks and Carl W. Maynard to E. I. duPont de Nemours & Co.
Production of dyestuff comprising condensing 4-sulfo-2-nitro-chlorbenzene with a para-substituted amine. No. 2,443,666. George W. Seymour and Victor S. Salvin to Celanese Corp. of America.
N-substituted aminoanthraquinone dyestuff by reacting an aminohydroxy anthraquinone sulfonic acid with an aldehyde and with hydrous oxalic acid. No. 2,443,899. Armas Victor Erkkila and Robert C. Hoare to Allied Chemical & Dye Corp.
Composite titanium oxide-calcium sulfate pigment. No. 2,444,237. Leif Aagaard and Winfred J. Cauwenberg to American Cyanamid Co.
Composite titanium oxide-calcium sulfate pigment. No. 2,444,238. Leif Aagaard, Winfred J. Cauwenberg and Walter R. Whately to American Cyanamid Co.
Titanium dioxide pigments by dialyzing a colloidal dispersion of titanium hydrate nuclei. No. 2,444,939. Max J. Mayer.
Production of titanium dioxide pigments. No. 2,444,940. Max J. Mayer.
Dyestuffs of the anthraquinone series. No. 2,445,007. George W. Seymour, Victor S. Salvin, and Clarence E. Hieserman to Celanese Corp. of America.
Recovering spent dye liquors by treatment with activated carbon and product thereof. No. 2,445,323. Luigi C. Galatioto to Textron, Inc.
Indigosol composition comprising a naphthol sulfonate. No. 2,445,632. Earl L. Pelton and Charles O. Hutchenreuther to Dow Chem. Co.
Preparation of titanium dioxide by introducing a stream of air and titanium tetrachloride vapor into a reaction chamber. No. 2,445,691. Alphonse Pechukas to Pittsburgh Plate Glass Co.

Canadian

A stabilized diazo compound having the general formula $R—N=N—R_1$ in which R is the nucleus of an aromatic amine capable of producing azo dyestuffs and R_1 is a radical of a derivative of cyanamide having a free NH_2 group, one hydrogen of which is substituted by a radical of the formula: $(R_2O)_nR_3OH$, in which R_2 is alkylene, R_3 is alkylene, and n is an integer. No. 450,395. Paul P. McClellan and Walter P. Ericks to American Cyanamid Co.
Treating materials comprising fibres, films and the like of an ester or ether of cellulose, dyed with water-insoluble dyes that are not normally fast to the combustion products of coal gas, to improve the fastness which comprises incorporating in the material **a small** proportion of a water-insoluble resinous condensation product of an aldehyde with an aminotriazins. No. 450,404. Henry Charles Olpin and Sydney Alfred Gibson to Canadian Celanese, Ltd.
Improved finely-ground finished titanium pigment comprising calcined titanium dioxide with a minor amount of a precipitate, comprising at least one fourth group tetravalent metal having an atomic number of at least 22 in hydrous oxidic compound form, and at least one trivalent element in hydrous oxidic compound form, said precipitate having been associated with said pigment subject to calcination of the latter. No. 450,537. George Reel Seidel to Canadian Industries, Ltd.
Tris- and poly-azo-dyestuffs. No. 450,578. Fritz Straub and Jakob Brassel and Peter Pieth to Ciba, Ltd.
Cyanine dyes. No. 450,588. Edmond Burrus Middleton and George Alexander Dawson to E. I. du Pont de Nemours & Co.
Production of anthraquinone dyestuffs fast to acid fading, which comprises condensing an aliphatic aldehyde with a 4,8-di-hydroxylamino-anthrarufine. No. 450,613. George W. Seymour and Burnard Theodore Pull to Camille Dreyfus.
Producing a chlorine-free pigment of the copper phthalocyanine type which comprises reacting phthalonitrile with cupric chloride at a reaction temperature which would flormally produce a chlorinated pigment, in the presence of a substantially inert organic diluent liquid, the reaction being carried out in the presence of anhydrous ammonia to combine with all chlorine which may be set free in the reaction. No. 450,674. Harold Talbot Lacey to American Cyanamid Co.
Dyestuff dispersible in water immiscible organic solvents comprising the reaction product of a dyestuff having sulfonic acid groups with an ester of a condensation product of ethylene oxide and triethanolamine. No. 450,675. Harold T. Lacey and Walter E. Ness to American Cyanamid Co.
Manufacture of disazo dyestuffs, comprising coupling tetrazotized 3:3'-dihydroxy-4:4'-diaminodiophenyl with two molecular proportions of coupling components in a medium alkaline with at least one hydroxide of the alkali and alkaline earth metal series. No. 450,705. Fritz Straub, Jakob Brassel, and Peter Pieth to Ciba, Ltd.

Equipment

Filtration apparatus. No. 23,009. Thomas R. Camp.
Apparatus for drying with liquefied gas. No. 2,443,610. Esther R. Elder to William R. Harriman, Esther Anne Harrington, and Mary Ellen Peachman.
Vacuum pan discharge valve control. No. 2,443,628. John E. Mason to Stearns-Roger Manufacturing Co.
Diffusion pump. No. 2,443,667. Frederick W. Stallmann to Westinghouse Electric Corp.
Electrical precipitator. No. 2,443,780. Harry A. Wintermute to Research Corp.
Bubble cap. No. 2,443,812. Archie M. Ackroyd to Standard Oil Development Co.
Rotary pump. No. 2,443,994. Salvatore Scognamillo.
Pump. No. 2,444,100. Robert H. Hill to Marison Co.
Measuring and controlling apparatus for fluid flow. No. 2,444,101. Clarence Johnson, Harvard H. Gorrie and Paul S. Dickey to Bailey Meter Co.
Combined pressure and temperature relief valve. No. 2,444, 130. Matthew R. Crowe.
Vibratory conveyor. No. 2,444,134. Harker H. Hittson to Jeffrey Manufacturing Co.
Valve. No. 2,444,137. Donald W. Main to Aeroquip Corp.
Liquid filter element. No. 2,444,147. George M. Walton to Air-Maze Corp.
Fluid pump. No. 2,444,159. Louis E. Godfriaux to Gisholt Machine Co.
Check valve. No. 2,444,182. Albert W. Calvin.
Rotary cylinder pump. No. 2,444,234. Sterling O. Stageberg.
Seal for shafts. No. 2,444,249. Maynard E. Estey to Estey Pump Co., Inc.
Drying apparatus for the dustless treating of solid material No. 2,444,383. Frederic E. Stynler.
Valve. No. 2,444,401. William J. Gartz to Crane Co.
Maintaining constant temperature of liquids. No. 2,444,416. Eugene Elroy Bergman.
Evaporator foam control apparatus. No. 2,444,454 Walter B. Leaf.
Scraping device for rotary drum filters. No. 2,444,466. C. Lynn Peterson to Peterson Filters and Engineering Co.
Regulating apparatus combining a pressure filter with an inlet for the material to be filtered and an outlet for the solids. No. 2,444,563. Adam H. Gebauer to Tide Water Associated Oil Co.
Pump. No. 2,444,586. Charles Erb Wuensch.
Eductor. No. 2,444,615. Albrecht E. Reinhardt to Derbyshire Machine & Tool Co.
Mixer valve and control. No. 2,444,631. Thomas B. Chace to Dole Valve Co.
Valve assembly. No. 2,444,703. Harry Roswell Jones to Continental Oil Co.
Heat exchange element. No. 2,444,825. Frank R. Higley to Bryant Heater Co.
Fluid heat exchange installation. No. 2,444,908. Ervin G. Bailey and Ralph M. Hardgrove and Thomas B. Stillman to Babcock & Wilcox Co.
Apparatus for pumping. No. 2,444,912. Albert G. Bodine, Jr.
Valve construction. No. 2,444,942. Benjamin H. Miller to Babcock & Wilcox Co.
Pump control mechanism. No. 2,444,952. Win W. Paget to Joy Mfg. Co.
Bubble cap. No. 2,445,083. Merrill R. Reed.
Apparatus for heat transfer with granular solids. No. 2,445,092. Ernest Utterback to Socony-Vacuum Oil Co.
Heat exchanger. No. 2,445,115. Francis P. Hanrahan to U. S. A., represented by Secy. of Agriculture.
Hot liquid pump. No. 2,445,127. Earl B. Schwenk.
Pumping apparatus. No. 2,445,205. Lewis Burn.
Pump. No. 2,445,232. Hans Molly (vested in the Attorney General of the U. S.).
Regulating mechanism responsive to variations in density and temperature of liquids. No. 2,445,255. Gavin S. Younkin to Brown Instrument Co.
Hydraulic pump. No. 2,445,281. Charles H. Rystrom.
Diaphragm pump. No. 2,445,293. Stanley S. Lippincott to Flexitallic Gasket Co.
Heater. No. 2,445,316. Barthooneo De Lorenzo to Foster Wheeler Corp.
Heat exchanger. No. 2,445,471. Robert E. Buckholdt to The Salem Engineering Co.
Valve. No. 2,445,505. Benjamin N. Ashton to Electrol, Inc.
Flow-regulating valve. No. 2,445,544. Walter C. Trautman to Bendix Aviation Corp.
Variable output pump. No. 2,445,603. Horace A. Cartwright.
Excess flow valve. No. 2,445,612. Chester Fanshier.
Apparatus for mixing. No. 2,445,617. Maximilian P. Hofmann to The C. O. Bartlett & Snow Co.
Continuous nitrating apparatus. No. 2,445,741. Arvel O. Franz and Oron C Keplinger to Olin Industries, Inc.
Radiation thermopile. No. 2,445,874. Deslonde R. de Boisblanc and Hugh M. Barton, Jr., to Phillips Petroleum Co.
High-pressure valve. No. 2,445,885. Donald R. McMullen.
Rotary gear pump. No. 2,445,967. Reginald J. S. Pigott and Fred E. Fleischer to Gulf Research & Development Co.
Valves. No. 2,446,139. Barney J. Lyons.
Electric proportioning control apparatus with reset. No. 2,446,163. William H. Wannamaker, Jr., to Brown Instrument Co.
Rotary fluid pump. No. 2,446,194. David Samiran.
Double seal valve. No. 2,446,196. Massey Sitney.
Valve. No. 2,446,274. John N. Gladden to Gladden Products Divn. of Los Angeles Turf Club, Inc.

Fluid valve. No. 2,446,334. Gustave J. Koehler.
Fluid filtering device. No. 2,446,364. Daniel Douglas Demarest.
Slurry feeding apparatus. No. 2,446,373. William B. Klein.
Chimney type heat regenerator. No. 2,446,420. William J. Irwin.

Canadian

Piston pump. No. 450,366. Niels A. Christensen.
Apparatus including a tray clarifier for a liquor suspension adapted to decant clarified liquor and to yield thickened underflow of mud washed and settled from the mother liquor. No. 450,419. Cyril H. Knight to Dorr Co.
Regenerating an ionic exchanger bed, which comprises passing through the bed a volume of solution containing regenerant chemical obtained from a previous regeneratton operation. No. 450,420. Franklin Nathan Pawlings to Dorr Co.
Chemical feed pump mechanism. No. 450,437. Jeff Corydon, II, to Morse Boulger Destructor Co.
Suction valve for reciprocating pumps. No. 450,519. Carl G. Thurnau.
Valve closure, comprising a movable valve member having at least a facing of readily deformable elastic material which is adapted to be applied to the valve seating by fluid pressure. No. 450,640. Jean Louis Gratzmuller.
Apparatus for continuously cooling liquids including liquefied fats, oils or the like. No. 450,737. Henry Lamont Murray to Murray Deodorisers, Ltd.
Centrifugal pump. No. 450,752. A. I. Harlamoff to A. O. Smith Corp.
Pump. No. 450,832. Adam Gabriel to Acme Industrial Hydraulics.
Plate arrangement for preheaters. No. 450,833. Robert M. Gates to Air Preheater Corp.
Pump. No. 450,976. Jean Mercier.

Explosives

Reclaiming explosive charges contained in shell cases. No. 2,444,045. Cedric A. Hoskin.

Food

Concentrating plant juices by chilling. No. 2,443,867. Harry A. Noyes.
Production of sweet-potato starch. No. 2,443,897. Gregory M. Dexter and Francis H. Thurber to U. S. A. as represented by the Secretary of Agriculture and U. S. Sugar Corp.
Flour-enriching composition. No. 2,444,215. Robert S. Whiteside and Peter V. Kolb to Winthrop-Stearns, Inc.
Emulsified food fats. No. 2,444,307. Frederick H. Penn.
Incorporating solid fat in liquid fatty mixtures. No. 2,446,178. Bertie S. Harrington to Armour & Co.
Imitation maple flavor. No. 2,446,478. Roland E. Kremers to General Foods Corp.

Inorganic

Treatment of alkali metal salts in an indirect heat exchange system. No. 23,017. John R. Bates to Houdry Process Corp.
Utilization of spent pickling acid and crude coke works ammonia in the manufacture of ammonium sulfate and iron hydrates or oxides. No. 2,443,765. Charles B. Francis.
Manufacturing hydrogen chloride by introducing hydrogen and chlorine gases into a burner. No. 2,444,256. Earl S. Hill to Shell Development Co.
Drying and conditioning sulfate of ammonia and other granular and crystalline products. No. 2,444,406. George Royston.
Catalyst consisting of alumina, zinc oxide and copper. No. 2,444,509. Vladimir N. Ipatieff and Vladimir Haensel to Universal Oil Products.
Insulating and dielectric materials by molding iron phosphate particles. No. 2,444,766. Frank M. Clark to General Electric Co.
Catalyst of fibrous asbestos. No. 2,444,896. Louis Lionel Shreir to Baker & Co., Inc.
Zirconia containing catalysts. No. 2,444,913. George R. Bond, Jr., to Houdry Process Corp.
Barium carbonate-asbestos catalyst. No. 2,444,930. Frederick Wardle Haywood and Douglas Stuart Laidler ½ to Wild-Barfield Electric Furnaces, Ltd.
Catalyst consisting of from 50% to 90% of aluminum oxide. No. 2,444,965. Charles L. Thomas and Jacque C. Morrell to Universal Oil Products Co.
Alkali metal hydroxide liquid reagent. No. 2,445,064 Archibald John Hall and Frederick Charles Wood to Tootal Broadhurst Lee Co., Ltd.
Forming SO_2 by burning sulfur. No. 2,445,112. Worthington T. Grace and Joseph C. Muller, Jr., to E. I. du Pont de Nemours & Co.
Chlorine and sodium sulfate from the interaction of sodium chloride and sulfur trioxide. No. 2,445,117. Ralph K. Iler to E. I. du Pont de Nemours & Co.
Hydraulic removal of gel. No. 2,445,221. Paul D. Isanogle and Mahlon H. Replogle to Davison Chem. Corp.
Electrolyte for primary cells of lithium bromide. No. 2,445,306. Herbert E. Lawson to U. S. A., represented by Secy. of Navy.
Titania gel-boria catalyst. No. 2,445,346. Gerald C. Connolly to Standard Oil Development Co.
Removal of acidic constituents from gases by contacting the gas with a solution of an amine, water and a monohydric aliphatic alcohol. No. 2,445,468. Clyde L. Blohm, Fred C. Riesenfeld, and Henry D. Frazier to The Fluor Corp., Ltd.
Preparation of catalysts of aluminum chloride impregnated porous solid. No. 2,446,100. Alex G. Oblad and Edward R. Boedeker to Socony-Vacuum Oil Co., Inc.
Silver catalysts consisting from about 0.5% to about 5% by weight of sodium oxalate. No. 2,446,132. Theodore W. Evans to Shell Development Co.
Condensing vaporized metal halides. No. 2,446,181. Philip Berkeley Kraus to E. I. du Pont de Nemours & Co.
Aluminum halides by the reaction of alumina, carbon, and free halogen. No. 2,446,221. Robert P. Ferguson to Standard Oil Development Co.
Purification of sludge acid with a sub-bentonite clay. No. 2,446,273. Wright W. Gary to Filtrol Corp.
Manufacture of carbon black by the impingement process. No. 2,446,351. Ira Williams and Frank W. Selfridge to J. M. Huber Corp.
Absorption of ammonia in soda ash production by brine liquor. No. 2,446,442. John Ross Taylor.
Converting normal ammonium fluoride to ammonium bifluoride. No. 2,446,484. Francis M. McClenahan.

Canadian

Purifying a ferricyanide in aqueous solution by reacting an alkaline substance therewith at a pH of at least 9.0 removing the precipitate and recovering the clarified ferricyanide. No. 450,396. Luis L. Lento, Jr., and Alfred G. Houpt to American Cyanamid Co.
Producing substantially anhydrous hydrogen chloride by contacting a moving column of solid lumps of calcium chloride with liquid aqueous hydrogen chloride solution. No. 450,403. Rock L. Comstock to Bay Chem. Co., Inc.
Two stage causticizing of green liquor derived from a smelt dissolving station. No. 450,418. Cyril H. Knight to Dorr Co.
Method of applying a fluoride phosphor to a base. No. 450,458. Humbolt W. Leverenz to Radio Corp. of America.
Acid etching composition comprising 1% to 18% by weight of nitric acid, 5%-30% by weight of water, and the balance being phosphoric acid. No. 450,570. John C. Lum and George W. Jernstedt to Canadian Westinghouse Co., Ltd.
Manufacture of barium carbide by passing a reaction mixture of carbon and barium oxide, or a compound yielding barium oxide at or below the reaction temperature, in the form of porous agglomerated masses continuously through a reaction zone in which they are heated to the reaction temperature in the absence of nitrogen and whilst removing carbon monoxide from the reaction zone. No. 450,688. John Godolphin Bennett and Marcello Pirani to C.U.R.A. Patents, Ltd.
Production of oxide gels by interaction of a compound of a metal and a precipitating agent the process of mixing said metal compound with an organic compound substantially unreactive with respect to said metal compound and slowly decomposable within the mixture to produce a reactive precipitating compound and a volatile organic product. No. 450,721. George Raynolds Bond, Jr., to Houdry Process Corp.

Metals, Ores

Electroplating on tungsten. No. 2,443,651. Joseph J. Cannizzaro to Westinghouse Electric Corp.
Manufacture of thorium by mixing the oxide with calcium. No. 2,446,062. Harvey C. Rentchler, William C. Lilliendahl and John E. Gray to Westinghouse Electric Corp.
Recovering manganese electrolytically from a solution containing manganese sulphate. No. 2,446,313. Dmitri Vedensky.
Vacuum production of magnesium by vaporizing. No. 2,446,403. Georges Bassereau to Societe D'Etude Pour L'Industrie Du Magnesium.

Canadian

Extracting gold and silver from ores by amalgamation with mercury. No. 450,375. Stuart Johnston.
In the froth flotation process of separating acidic silicious gangue from phosphate ore, the step which comprises subjecting the ore to froth flotation in the presence of a product of the group consisting of those represented by the following formula: $RR'N—C(NH_2)NH \cdot HX$, in which R is an alkyl radical containing from 8 to 20 carbon atoms, R' is a member of the group consisting of hydrogen and an alkyl radical containing from 8 to 20 carbon atoms, and X is a halogen radical, producing a tailing high in phosphate and relatively low in gangue. No. 450,397. David W. Jayne, Harold M. Day and Elmer W. Gieseke to American Cyanamid Co.
Method of floating silica from a non-metallic ore which comprises conditioning an ore pulp with a solution of a condensation product higher fatty acids with polyalkylene polyamines. No. 450,398. Ludwig J. Christmann to American Cyanamid Co.
Flux for reclamation of highly oxidizable metals from finely divided scrap by fusion, said flux containing about 1 to 10% magnesium chloride and a portion constituting at least 90% of said flux consisting of potassium chloride and sodium chloride, said portion being composed of 22 to 60% potassium chloride and 40 to 78% sodium chloride. No. 450,522. Frank Dubois Chew to Aluminum Co. of America.
Depositing nickel from a bath containing chloride equivalent to at least about eighty-five per cent of its nickel as nickel chloride and supplying nickel to the bath by using a cathode-nickel anode. No. 450,535. Clayton Melvern Hoff and Ernest William Schweikher to Canadian Industries, Ltd.
Nickel plating composition comprising nickel chloride, nickel sulphate and 2-phenyl ethylene sulphonic acid. No. 450,536. Raymond Alan Hoffman to Canadian Industries, Ltd.
Nickel plating composition comprising a nickel compound and containing chloride anion and sulphate anion in the ratio of 5:1 to 20:1 on the basis of equivalents, the composition containing a sulphobenzaldehyde selected from the group consisting of meta sulphobenzaldehyde and parasulphobenzaldehyde as an addition agent. No. 450,538. Raymond Alan Hoffman to Canadian Industries, Ltd.
Production of magnesium by heating under a pressure not exceeding 60 mm. of mercury at a temperature of about 1100° C. to 1425° C. a mixture consisting of a magnesium silicate, lime and a material selected from the group consisting of silicon and metal silicides in proportions such that the residual calcium silicate has a composition approximating bicalcium silicate and condensing the volatilized magnesium on a surface maintained at a temperature between 450° C. and 650° C. No. 450,539. Roger Gordan Aitken to Canadian Industries, Ltd.
Manufacture of metallic magnesium from magnesium oxide through reaction with carbon and shock-chilling of the reaction products. No. 450,736. Edgar Clynton Ross Spooner to Magnesium Metal Corp., Ltd.
Electro-depositing bright silvery corrosion-resisting coatings of a ternary alloy composed of from 50%-75% copper, 15%-30% tin and 5%-20% zinc. No. 450,567. George W. Jernstedt to Canadian Westinghouse Co.
Process of metal recovery in which a gas-vapor mixture containing carbon monoxide and a vapor of a metal miscible with molten aluminum is contacted with a molten aluminum body and vapor of said miscible metal absorbed in said body, the improvement consisting in providing said aluminum body with a content of beryllium and manganese. No. 450,671. Philip Trimble Stroup and Charles Blake Willmore to Aluminum Co. of Amer.
Article of manufacture subjected to corrosive attack by estuarine or sea waters made of an aluminum-free alloy comprised of about 2-12.5% nickel, about 0.5-3% iron, up to about 1% manganese, and the balance substantially all copper. No. 450,687. Edwin Andrew Guthrie Liddiard and George Leo Bailey to British Non-Ferrous Metals Research Assoc.
Copper base alloy combining high strength with high electrical conductivity consisting of from 0.5-1% tellurium, from 0.06 to 0.1% metallic nickel, 0.02-0.1% oxygen and the balance copper. No. 450,712. John Sykes to Enfield Rolling Mills, Ltd.
Recovering zinc from mixtures consisting predominantly of zinc and containing iron utilizing a container for the mixture in molten form, which method comprises charging the molten mixture into the container, raising the temperature of the mixture so charged under substantially non-oxidizing conditions to a temperature less than that of the melting point of iron for evaporating zinc from the molten mixture. No. 450,750. Frank F. Poland to Revere Copper & Brass, Inc.
An article of manufacture comprising an electrically conducting base member, a thin electrodeposited coating of a thickness of from 0.1-0.5 mils of a bright silvery ternary alloy composed of from 50-75% copper, 20-35% tin and from 8-15% zinc applied to the base member, and a thin coating less than 0.1 mils in thickness of chromium electrodeposited over the ternary alloy coating. No. 450,865. George W. Jernstedt to Canadian Westinghouse Co., Ltd.

Treating barite concentrates, coated with reagents owing to have been produced by flotation, involving the use of anionic reagents in an aqueous pulp of the barite ore, to make said barite concentrates wettable and useful in drilling muds, which comprises agitating said concentrates in an aqueous pulp containing a strong mineral acid. No. 450,921. James D. Duke to Minerals Separation No. Amer. Corp.

Process of purifying impure aluminum and magnesium by melting, providing a suitable flux to cover the molten metal, puddling the flux and molten metal to cause intimate contact between the flux and interior portions of the body of molten metal, causing thickening of the flux, whereby certain heavy metallic elements precipitate out of the molten metal, coagulate with the flux and settle with the portions of the flux around the sides and bottom of the melting vessel separating the molten metal from the flux and distilling the volatile metals from the aluminum. No. 450,924. Walter Bonsack to Nat'l Smelting Co.

Organic

3-Amino-4-carbethoxy-2-alkyl derivatives of thiophene. No. 2,443,598. Lee C. Cheney and John Robert Piening to Parke, Davis & Co.

Fluorination of carbon tetrachloride. No. 2,443,630. Earl T. McBee and Zara D. Welch to Purdue Research Foundation.

Surface active composition which comprises organic nitrogen base salts of a mixture of acids, said mixture of acids including sulfonated ketones, sulfonated amines, sulfonated alkylidene sulfanates sulfonated alkyl sulfamates and bisulfite addition products of sulfonated alkylidene sulfamates by reaction of a nitrosating agent of the class consisting of NOCl NOBr, N_2O_4 and N_2O_3. No. 2,443,716. Leland James Beckham and William Alfred Fessler to Allied Chemical & Dye Corp.

Dehydration of alkyl ketones in the presence of a catalyst comprising a salt of a metal of the iron group and of a middle halogen. No. 2,443,732. Vladimir N. Ipatieff and Carl B. Linn to Universal Oil Products Co.

Preparing sulfonamides by oxidizing to SO_2N the -S-N< linkage of a benzene sulfonamide. No. 2,443,742. Walter Lorenz, Robert Behnisch, and Fritz Mietzsch to Winthrop-Stearns, Inc.

Apparatus for producing alkylated aromatic compounds. No. 2,443,758. James L. Amos, Clarence C. Schwegler and William Howard Bezenah to Dow Chemical Co.

Diethylamino ethyl ether of diisopropyl carbine. No. 2,443,796. Henry Martin, Karl Gätzi and Alfred Margot to J. R. Geigy A. G.

Production of thioxylenol by reacting hydrogen sulfide with 3,5,5-trimethyl cyclohexen-2-one in the presence of a catalyst comprising crystalline alumina alpha monohydrate. No. 2,443,811. De Loss E. Winkler and Seaver A. Ballard to Shell Development Co.

Manufacture of alpha-methyl-beta-acetyl-acrylic acid by subjecting mesityl oxide dissolved in an inert organic diluent to oxidation with molecular oxygen. No. 2,443,818. Alec Elce, Reginald Harold Hall and Karl Heinrich Walter Tuerck to The Distillers Co., Ltd.

Sulfurized terpene obtained by the sulfurization of one member of the group consisting of dipentene and terpinolene. No. 2,443,823. Lee Cone Holt to E. I. du Pont de Nemours & Co.

Preparing alpha acetyl gamma butyrolactone by reacting ethylene oxide with ethyl acetoacetate in an aqueous solution of an alkali metal hydroxide. No. 2,443,827. William L. Johnson to U. S. Industrial Chemicals, Inc.

Producing phthalic anhydride by reacting vapors of orthotoluic acid with oxygen in contact with a fluid catalyst material of silica gel impregnated with vanadium pentoxide. No. 2,443,832. Charles E. Morrell and Leland K. Beach to Standard Oil Development Co.

Stabilization of mercaptans with an alkyl acid-ester of an oxygen acid of phosphorus. No. 2,443,835. Charles J. Pedersen to E. I. du Pont de Nemours & Co.

Condensation of olefinic compounds with hydrogen sulfide. No. 2,443,852. John L. Eaton and John F. Olin to Sharples Chemicals, Inc.

Fluidized-solid process for forming carbon disulfide. No. 2,443,854. Robert P. Ferguson to Standard Oil Development Co.

Production of an alpha-aminoanthraquinone by heating a neutral alpha-anthraquinone sulfonate with an aqueous ammonium arsenate solution. No. 2,443,885. Curt Bamberger to Allied Chemical & Dye Corp.

Nitratoalkyl amides. No. 2,443,903. William Frederick Filbert to E. I. du Pont de Nemours & Co.

Production of ether by boiling a mixture of alcohol and an aqueous solution of sulfuric acid. No. 2,443,906. Henri Martin Guinot and Jean Gardais to Les Usines De Melle.

Fermentation process for production of α-ketoglutaric acid. No. 2,443,919. Lewis B. Lockwood and Frank H. Stodola to U. S. A. as represented by Secretary of Agriculture.

Producing free-flowing crystalline sulfadiazine. No. 2,443,956. George Elisha Hall, Jr., Martin Everett Hultquist and Leonard Henry Dhein to American Cyanamid Co.

Preparation of heterocyclic compounds by reacting 2,4,5-triamino-6-hydroxy pyridine, an alpha, alpha, beta-trihalopropionaldehyde and an amino acid amide of paraaminobenzoic acid. No. 2,444,002. James H. Boothe to American Cyanamid Co.

Preparation of pterins from 2,4,5-triamino-6-hydroxy pyrimidine, a 3-halo-2-isonitrosopropionaldehyde, and a member of the group consisting of aminobenzoic acid and its salts, esters, and amides. No. 2,444,005. Donna Bernice Cosulich to American Cyanamid Co.

Stabilization of unsaturated ketones against color change. No. 2,444,006. Hans Dannenberg to Shell Develoment Co.

2-Sulfanilamidopyrazine from sulfanilamide, a halopyrazine, and a member of the group consisting of alkali metal carbonates and alkali metal bicarbonates. No. 2,444,012. Elmore H. Northey and John S. Webb to American Cyanamid Co.

Dimethyl urea by reacting methyl amine and phosgene in an aqueous medium and adding a caustic alkali. No. 2,444,023. August H. Homeyer to Mallinckrodt Chemical Works.

6-Cycloalkylmethyl-2-thiouracils. No. 2,444,024. Sydney Archer to Sterling Drug, Inc.

Recovering an ascorbic acid compound from solution. No. 2,444,087. Henry H. Bassford, Jr., to Merck & Co., Inc.

Dihydronordicyclopentadienyl-substituted formals. No. 2,444,090. Herman A. Bruson to Resinous Products & Chemical Co.

Production of a methylcyclopentanol by halogenating methylcyclopentane to produce a methylcyclopentyl halide and reaction with a substantially anhydrous salt of a carboxylic acid. No. 2,444,129. Arthur E. Bearse and John E. Leonard to Standard Oil Co.

Separation of ammonia and hydrocarbons from mixtures containing ammonia, propane, propylene, and higher boiling materials by fractionally distilling. No. 2,444,175. John W. Teter and Reading Barlow Smith to Sinclair Refining Co.

Reacting an alkylated indene with a phenolic compound. No. 2,444,233. Frank J. Soday to United Gas Improvement Co.

Preparation of fumaric acid adducts by reacting fumaric acid and at least one conjugated diene hydrocarbon. No. 2,444,263. Leslie C. Lane and Charles H. Parker, Jr., to American Cyanamid Co.

Preparing pectinic acids of low methoxyl content from citrus peel. No. 2,444,266. Harry S. Owens and William Dayton Maclay to U. S. A. as represented by Secretary of Agriculture.

Preparing organogermanium halides. No. 2,444,270. Eugene G. Rochow to General Electric Co.

Preparation of phosgene by contacting in a reaction zone a mixture of the chlorides of copper with carbon monoxide. No. 2,444,289. Everett Gorin and Charles Burke Miles to Socony-Vacuum Oil Co., Inc.

Recovery of glycerol from polyglycerol by extracting with a solvent. No. 2,444,296. Gerald Inman Keim, John Ross, and Joseph Henry Percy to Colgate-Palmolive-Peet Co.

Preparing a mixture of gamma-acetopropanol and gamma-valerolactone from 1,4-pentanediol. No. 2,444,301. Lucas P. Kyrides and Ferdinand B. Zienty to Monsanto Chemical Co.

Monohydric alcohol ester of an acedic adduct which is an acyclic alpha-beta unsaturated acid. No. 2,444,328. Charles M. Blair, Jr., to Petrolite Corp., Ltd.

Recovery of nordihydroguaiaretic acid from plant extracts by contacting with an alkaline material. No. 2,444,346. Ole Gisvold to Regents of University of Minnesota.

Alkyl-amino-alkyl para-alkoxybenzoates. No. 2,444,395. Walter G. Christiansen and George O. Chase to E. R. Squibb & Sons.

Ethylhexoic acid by hydrogenating alpha-ethyl beta-propyl acrolein in the liquid phase. No. 2,444,399. Bruce Duval and Karl Heinrich Walter Tuerck to Distillers Co., Ltd.

Tetrachlorobutyronitrile. No. 2,444,478. John W. Teter and Oscar W. Bauer to Sinclair Refining Co.

Acetals and mercaptals of aldehydes having two vicinal mercapto groups and their self-condensation polymers. No. 2,444,525. Albert A. Pavlic to E. I. du Pont de Nemours & Co.

N-aryl-maleimides from N-phenylmaleamic acid, acetic anhydride and the acetic anhydride of sodium acetate. No. 2,444,536. Norman Edward Searle to E. I. du Pont de Nemours & Co.

Purification of organic nitriles by bringing the nitriles into contact with cation exchange material and anion exchange material. No. 2,444,589. William A. Blann to American Cyanamid Co.

Isopropylidene-*p*-phenoxy-2-ethanol-*p*-phenoxyacetic acid. No. 2,444,594. Harold M. Day and David W. Jayne, Jr., to American Cyanamid Co.

Resinous acrylic polymers of high abrasion resistance. No. 2,444,655. Edwin H. Kroeker and Willard J. Croxall to Rohm & Haas Co.

Salts of dithiocarbamic acids. No. 2,444,660. Roger A. Mathes to The B. F. Goodrich Co.

Production of acetylene tetrachloride by reaction of acetylene with chlorine. No. 2,444,661. Aylmer H. Maude to Hooker Electrochemical Co.

Solvent fractionation of tall oil with an open chain alcohol. No. 2,444,730. Lowell O. Cummings and Henry A. Vogel to Pittsburgh Plate Glass Co.

Monoesters of dicarboxylic acids from hydrogenating, in the presence of a metallic catalyst an ester lactone. No. 2,444,735. Hugh J. Hagemeyer, Jr., to Eastman Kodak Co.

Terpene isomerization. No. 2,444,790. Alfred L. Rummelsburg to Hercules Powder Co.

Production of acetophenone by passing an oxygen containing gas through liquid ethylbenzene containing an exidation catalyst. No. 2,444,816. William S. Emerson and Victor E. Lucas to Monsanto Chemical Co.

Recovery of pentoses and hexosans from wood liquors by fermentation. No. 2,444,823. Horace E. Hall and Lester L. Coleman to Masonite Corp.

Nitromethane-acetone-adipic acid condensation polymer. No. 2,444,827. Albin Johnson to Tek Hughes, Inc.

Manufacture of nitriles by heating cyanuric acid with a fatty acid. No. 2,444,828. William Kaplan to Sun Chemical Corp.

Alpha beta dimethylene succinonitrile. No. 2,444,882. Pliny O. Tawney to U. S. Rubber Co.

Ketogulonic acid and its esters by oxidation of sorbose with nitric acid. No. 2,444,885. Pancras J. van der Laan to Nederlandsche Organisatie voor toegepastnatuurwetenschappelijk onderzoek ten vehoeve van de Voeding.

Recovery of methyl ethyl ketone from azeotropic distillates by extraction with tetraethylene glycol. No. 2,444,893. George R. Lake to Union Oil Co. of Calif.

Oxidizing primary or secondary alcoholic hydroxyl groups or aldehyde groups in the liquid phase by the combined action of free bromine and an inorganic oxidizing agent. No. 2,444,924. Ladislaus Guillaume Farkas and Ozjasz Schachter.

Sulfonamide derivatives. No. 2,444,926. Zoltan Foldi, Arpa Gerecs, Istvan Demjen and Rezso Konig vested in Attorney General of U. S.

Diolefin extraction by contacting with a cuprous salt solution. No. 2,444,945. Charles E. Morrell to Standard Oil Development Co.

4,8,12-trimethyl-tridecyl-beta-haloethyl-methyl-carbinol No. 2,444,960. Lee Irvin Smith and Joseph A. Sprung to Regents of University of Minnesota.

Stabilized lecithin. No. 2,444,984. William J. Fitzpatrick to W. J. Fitzpatrick Co.

Steroid keto hydroxy acids and their polybasic acid esters. No. 2,445,006. Erwin Schwenk to Schering Corp.

Production of riboflavin. No. 2,445,128. Fred W. Tanner, Jr., Lynford J. Wickerham and James M. Van Lanen to U. S. A. represented by Secy. of Agriculture.

Conversion of furfuryl-alcohol with nitric acid. No. 2,445,137. Eduard Farber to Polyxor Chem. Co., Inc.

Preparation of thiolesters from tertiary alkyl mercaptan and an organic acid anhydride. No. 2,445,142. Chester M. Himel to Phillips Petroleum Co.

Purification of halogenated aromatic hydrocarbons in the presence of a catalyst. No. 2,445,195. Robert R. Umhoefer to General Electric Co.

Solutions of riboflavin. No. 2,445,208. Jesse Charney to Wyeth, Inc.

4-amino salicylic acid by diazotizing. No. 2,445,242. Karl-Gustaf Rosdahl to Aktiebolaget Ferrosan.

Manufacture of quaternary nitrogen compounds. No. 2,445,319. Heinz-Joachim Engelbrecht to American Hyalsol Corp.

Thiol derivatives. No. 2,445,356. Morris S. Kharasch and Sidney Weinhouse to United States of America represented by Secretary of War.

Amino-derivatives of dioxacyclopentane. No. 2,445,393. Ernest Fourneau to Societe des Usines Chimiques Rhone Poulenc.

Preparing finely divided nitroguanidine. No. 2,445,478. George H. Foster and Emil F. Williams to American Cyanamid Co.

Ethers of phenols by preparing a substantially solid mixture of an inorganic base and an alkali salt of a sulphonic acid and subjecting to the action of the vapour of an alcohol. No. 2,445,500. Daniel Tyrer.

Recovery of olefins from gaseous mixtures by contacting with an aqueous solution of cuprous chloride, and N-alkyl amide and hydrochloric acid. No. 2,445,520. Alfred W. Francis and Ebenezer E. Reid to Socony-Vacuum Oil Co., Inc.

Distillation of hexachlorethane. No. 2,445,526. Robert G. Heitz and Charles F. Oldershaw to The Dow Chemical Co.

Sulfonated polybenzyl by reacting chlorosulfonic acid, a reaction mass obtained by adding benzyl chloride to a suspension of aluminum chloride. No. 2,445,569. Arthur Lawrence Fox to E. I. du Pont de Nemours & Co.

Aliphatic esters of silicic acid by refluxing aliphatic alcohols with magnesium silicide. No. 2,445,576. Charles P. Haber to General Electric Co.
Preparing alkylaminoketone oximes by reacting a chlorinated ketoneoxime with a primary alkyl amine. No. 2,445,626. Glen H. Morey to Commercial Solvents Corp.
Beta-cyanoethyl ether of polymer of a beta, gamma-mono-olefinic monohydric alcohol. No. 2,445,652. Richard R. Whetstone to Shell Development Co.
Preparation of acrylonitrile from hydrocarbons and HCN. No. 2,445,693. Frank Porter and Glenn A. Nesty to Allied Chem. & Dye Corp.
2-anthrahydroquinone-carboxylic acid by reacting 2-anthraquinone-carboxylic acid with aqueous hydrosulfite reducing solution. No. 2,445,-699. Alvin J. Sweet to Allied Chem. & Dye Corp.
Production of methylfuran. No. 2,445,714. Robert F. Holdren to Iowa State College Research Foundation.
Preparation of solid tetrachlorobutane by reacting chlorine and butadiene, bubbling them through a liquid chlorination medium. No. 2,445,729. Milton R. Radcliffe and Chris E. Best to Firestone Tire & Rubber Co.
Resins from methylene dioxolanes. No. 2,445,733. Milton R. Radcliffe and William G. Mayes to Firestone Tire & Rubber Co.
2,6-di(alpha,alpha,gamma,gamma-tetramethylbutyl)-4-methylphenol. No. 2,445,735. Leland J. Kitchen to Firestone Tire & Rubber Co.
Distillation of 2,3-dichlorobutadiene-1,3. No. 2,445,738. William H. Willert to Firestone Tire & Rubber Co.
Conditioned naphthalene. No. 2,445,776. Hubert G. Guy to Koppers Co., Inc.
Alcohol-water fuel containing a heavy metallo-chlorophyllin. No. 2,445,-778. William J. Hale.
Hydrogenation of carbon oxides with a synthesis catalyst containing cobalt. No. 2,445,795. Alfred J. Millendorf to Texas Co.
Catalytic hydrogenation of carbon oxides. No. 2,445,796. Alfred J. Millendorf to Texas Co.
Preparation of leucine. No. 2,445,817. Sydney Archer and Noel F. Albertson to Winthrop-Stearns, Inc.
Dephenolization of coke-plant ammonia liquor containing hydrogen sulphide and ammonium salts by extraction with benzol. No. 2,445,825. Herbert A. Gollmar to Koppers Co., Inc.
Amino fatty derivatives from reacting a compound selected from the class consisting of 9,10-epoxystearic acid and 9,10-epoxyoctadecanol-1 with an aqueous compound selected from the class consisting of ammonia, methylamine, ethylamine, dimethylamine, diethylamine and phenylamine. No. 2,445,892. Daniel Swern and Thomas W. Findley to U.S.A. represented by Secy. of Agriculture.
Oxidation of barbituric acid to alloxan with an oxidizing agent selected from the group consisting of chromic acid, chloric acid and manganese dioxide. No. 2,445,898. Wilhelm Wenner to Hoffmann-La Roche, Inc.
Acetylating tri-ethyl citrate by reacting with acetic anhydride. No. 2,445,911. Charles H. Fisher and Martin L. Fein to U.S.A. represented by Secy. of Agriculture.
Acrylic esters of secondary alcohols. No. 2,445,925. Chessie E. Rehberg and Charles H. Fisher to U.S.A. represented by Secy. of Agriculture.
Metal salts of acyl phenol monosulfides. No. 2,445,939. Elmer W. Cook and William D. Thomas, Jr., to American Cyanamid Co.
Purification of readily polymerizable vinyl aromatic compounds by distillation. No. 2,445,941. Robert R. Dreisbach to Dow Chem. Co.
Isolation of styrene by azeotropic distillation with picolines and lutidines. No. 2,445,944. Karl H. Engel to Allied Chem. & Dye Corp.
Hydroxyphosphatides. No. 2,445,948. Harold Wittcoff to General Mills, Inc.
Solubilized alkaryl sulfonate. No. 2,445,975. Norman A. Shepard to American Cyanamid Co.
Sulfurizing terpenes. No. 2,445,983. Roger W. Watson to Standard Oil Co.
Alkylated boron compound by bringing a mixture of a boron halide and an alkyl halide into contact with a metal. No. 2,446,008. Dallas T. Hurd to General Electric Co.
Dialkenyl sulfides. No. 2,446,072. Robert T. Armstrong to U. S. Rubber Co.
Extracting gelose from seaweeds. No. 2,446,091. Harold Judson Humm to Duke University, Inc.
2-propenyl esters of α-halogenated aliphatic carboxylic acids. No. 2,446,-114. Roger W. Strassburg to U. S. Rubber Co.
Purifying carotene contaminated with chlorophyll and xanthophyll. No. 2,446,116. Monroe E. Wall and Edward G. Kelley to U. S. A. represented by Secy. of Agriculture.
Vinyl chloride by reacting hydrogen chloride in the vapor phase with acetylene, in the presence of a solid complex salt of mercuric chloride and cerium chloride. No. 2,446,123. Thomas Boyd to Monsanto Chem. Co.
Reaction of hydrogen halides with compounds having aliphatic unsaturation. No. 2,446,124. Thomas Boyd to Monsanto Chem. Co.
Carbonate-haloformate of glycerol. No. 2,446,145. Franklin Strain to Pittsburgh Plate Glass Co.
Distillation of alcohol from hydrolyzed mixtures of alkyl sulfates and sulfuric acid. No. 2,446,159. Henry O. Mottern and Francis M. Archibald to Standard Oil Development Co.
Preparing *p*-quinone dioxime from *p*-nitrosophenol with hydroxylamine. No. 2,446,165. Joseph H. Trepagnier to E. I. du Pont de Nemours & Co.
Preparation of acetals by reacting a vinyl ester of a carboxylic acid with a non-tertiary alcohol. No. 2,446,171. Willard J. Croxall and Harry T. Neher to Rohm & Haas Co.
2-acylamino-1,3-butadienes. No. 2,446,172. Joseph B. Dickey to Eastman Kodak Co.
Threonine and derivatives. No. 2,446,192. Karl Pfister, III and Max Tishler to Merck & Co., Inc.
Extraction of oxygenated organic compounds from aqueous solutions. No. 2,446,231. Carl E. Johnson to Standard Oil Co.
Alkali metal salts and alkali earth metal salts of halogenated lower fatty acids. No. 2,446,233. Bayard T. Lamborn to Hercules Powder Co.
Stabilization and purification of alkyl phenols derived from petroleum by reacting with anhydrous aluminum chloride. No. 2,446,250. Royal L. Shuman to Celanese Corp. of America.
Ester-acetals of polypentaerythritols. No. 2,446,257. Robert H. Barth to Heyden Chem. Corp.
Anhydrous ether by removing water from a low boiling lower alkyl ether by adding a silicon tetrahalide. No. 2,446,408. William K. Buchanan and William Simpson to General Electric Co.
Arylbiguanide hydrochlorides by heating a primary arylamine, a solvent and hydrogen chloride. No. 2,446,421. Barbara Rosamund Jacobs and Zvi Enrico Jolles to Imperial Chem. Industries, Ltd.
Preparing xylylene chlorides photochemically. No. 2,446,430. James A. Norton to E. I. du Pont de Nemours & Co.
Preparing acetone-chloroform from solid potassium hydroxide and phenylethylene glycol dialkyl ether. No. 2,446,453. Ernst Bergmann to Polymerisable Products, Ltd.

Production of secondary and tertiary halogenated alcohols by reacting of a trihalogen methane with an aldehyde. No. 2,446,454. Ernst Bergmann and Max Sulzbacher to Polymerisable Products, Ltd.
Glycerol alpha-allyl-gamma(2,4,5-trichlorophenyl)ether. No. 2,446,464. Theodore W. Evans and Donald S. Melstrom to Shell Development Co.
5-monoalkyl-barbituric acids by hydrogenating barbituric acid. No. 2,-446,503. Wilhelm Wenner to Hoffmann-La Roche.
Carboxylated monosubstituted barbituric acid. No. 2,446,504. Wilhelm Wenner to Hoffmann-La Roche.
Removing mercaptans from a liquid mixture of hydrocarbons **containing** low-boiling and high-boiling mercaptans. No. 2,446,507. Stephen P. Cauley to Socony-Vacuum Oil Co., Inc.

Canadian

Producing a mono-ether of an unsaturated dihydric alcohol by reacting a tertiary alkenyl ether with formaldehyde in the presence of a catalyst chosen from the group comprising substantially anhydrous inorganic metallic halides and metallic salts of halogenated organic acids, the metallic constituents of which are elements chosen from the second and fourth groups of the Periodic Table. No. 450,469. Louis A. Mikeska and Erving Arundale to Standard Oil Development Co.
N,N'-methylene bis 5-methyl, 5-ethyl hydantoin. No. 450,543. Joseph Frederic Walker to Canadian Industries, Ltd.
Aliphatic monocarboxylic acid: $(HS)_2RCO_2H$ wherein R is a trivalent saturated, straight chain, aliphatic hydrocarbon **radical of 2 to 10** carbon atoms, the carboxyl group **is attached to a terminal carbon of** the chain, one SH group is attached to the other terminal carbon of the chain and the second -SH group **is attached to the carbon con**tiguous to the terminal carbon bearing the SH group. No. 450,548. Wilbur Arthur Lazier and William Jennings Peppel and Albert Alan Pavlic to Canadian Industries, Ltd.
3,4-dimethyl-Δ^2-cyclopentenone. No. 450,549. Maynard Stanley Raasch and Clement Walter Theobald to Canadian Industries, Ltd.
N,N' methylene bis-5-methyl, 5-isobutyl hydantoin. No. 450,551. Joseph Frederic Walker to Canadian Industries, Ltd.
Obtaining a **beta(acylthio) aldehyde** providing an alpha, beta-unsaturated aldehyde, containing only one ethylene double bond as the sole carbon-to-carbon unsaturation, at a temperature below 0°C., and adding thereto dropwise with stirring, an aliphatic (monocarbothiolic) acid containing piperidine in an amount within the range of from 0·005% to 0·1%. No. 450,552. William Howells Vinton to Canadian Industries, Ltd.
Amination catalyst comprising cobalt supported on a carrier of synthetic magnesium silicate which has been subjected to heat treatment at 1200°F.-1300°F. to reduce its content of volatile matter to less than about 5%. No. 450,611. John W. Teter to Sinclair Refining Co.
Production of benzenesulfonylthioureas by the addition of hydrogen sulfide to the corresponding benzenesulfonylcyanamides characterized by the fact that the reaction is effected in an anhydrous medium and in the presence of a member of the class consisting of anhydrous ammonia and alkylamines and of a catalyst consisting of sulfur. No. 450,753. Paul Charpentier to Societe des Usines Chimiques Rhone Poulenc.
Producing 2-aminopyrimidine by reacting a guanidine salt with a beta-alkoxyacrolein acetal in the presence of a strong acid. No. 450,836. Anthony M. Moos and Robert W. Price to American Cyanamid Co.
Producing 3-aminopyridazine by heating a 3-halopyridazine with ammonia at temperatures of 100°C-200°C. No. 450,837. Philip S. Winnek to American Cyanamid Co.
Preparing bis-(2,4-dialkyl phenol)-4-alkyl phenol sulphides by reacting a 2,4-dialkyl phenol with a 4-alkyl phenol in the presence of a member of the group consisting of sulphur chloride and sulphur dichloride. No. 450,838. Elmer W. Cook and William D. Thomas, Jr., to American Cyanamid Co.
5-amino-7-hydroxy-1-u-triazolo (d) pyrimidine. No. 450,839. Jackson P. English, James R. Vaughan, Jr., and Richard O. Roblin, Jr., to American Cyanamid Co.
Preparing 2,4-oxazolidinediones by reacting an α-hydroxy primary amide with a dialkyl carbonate in the presence of a metal alcoholate. No. 450,917. Vernon H. Wallingford to Mallinckrodt Chemical Works.
Tetrahydrofurfuryl-alpha-chloroacrylate. No. 450,965. Joy Gabriel Litchy to Wingfoot Corp.

Paper Pulp

Processing of refined chemical pulp into viscose. No. 23,013. Paul Henry Schlosser and Kenneth Russell Gray to Rayonier, Inc.
Paper pulp from marsh reeds. No. 2,444,047. Louis D. Jordain.
Apparatus for using bagasse to make paper pulp. No. 2,446,418. Harry L. Horn.

Canadian

Reclaiming clean fibre from printed waste paper by soaking the waste paper in an alkaline solution. No. 450,381. Ernest Theodore McGregor.
Waterproof wrapping comprising a sheet of tough-texture paper impregnated with and having a coating of an amorphous wax and a sheet of cellulosic material adhered to one surface of said impregnated sheet and also coated with an amorphous wax, said wax coatings comprising a mixture of a soft amorphous wax having an approximate melting point of from 150°F.-155°F. and an amorphous wax having a melting point of approximately 165°F. No. 450,867. William Reucassel to Champion Paper Mills, Ltd.

Petroleum

Converting a paraffin hydrocarbon within the range of pentane to octane to obtain substantial yields of an isomerization product of higher octane number. No. 2,443,606. Edmond d'Ouville and Bernard L. Evering to Standard Oil Co.
Heptane isomerization. No. 2,443,607. Bernard L. Evering to Standard Oil Co.
Production of neohexane from hexane. No. 2,443,608. Bernard L. Evering and Edmond L. d'Ouville to Standard Oil Co.
Alkylation of hydrocarbons. No. 2,443,694. Ernest F. Pevere, Louis A. Clarke, and George B. Hatch to Texas Co.
Cracking hydrocarbon gases in the presence of finely divided coke. No. 2,443,714. Maurice H. Arveson to Standard Oil Co.
Cleaning residual crude oil and deposits from tanks. No. 2,443,721. Ernest D. Butcher, Jr.
Catalytic apparatus for the conversion of hydrocarbon gases. No. 2,443,-773. Maryan P. Matuszak to Phillips Petroleum Co.
High melting point waxes. No. 2,443,840. Ernest Stossel.
Refining of lubricating oils by subatmospheric distillation. No. 2,443,970. Paul M. Waddill to Phillips Petroleum Co.
Dehydrogenating hydrocarbons using as catalyst calcium oxide on calcium carbonate. No. 2,444,035. Ben Bennett Corson and George Arthur Webb to Koppers Co., Inc.
Polymerization process for gaseous olefins. No. 2,444,057. Robert V. J. McGee to Standard Oil Development Co.
Conversion of heavy hydrocarbon oil by mild **cracking.** No. 2,444,131. Jean Delattre-Seguy to Universal Oil Products Co.
Conversion of fluid hydrocarbons in the presence of a moving particle form contact material. No. 2,444,258. George L. Johnson to Socony-Vacuum Oil Co., Inc.
Petroleum wax substantially resistant to deterioration by exposure to light. No. 2,444,269. Joseph Phillips to L. Sonneborn Sons, Inc.
Recovering hydrogen fluoride from hydrocarbon mixtures by **alkylation.** No. 2,444,316. Lucien H. Vautrain to Phillips Petroleum Co.
Catalytic cracking of hydrocarbons for the production of substantially saturated gasoline. No. 2,444,545. Charles L. Thomas to Universal Oil Products Co.
Selective solvent treatment of liquid hydrocarbon mixtures for segregation of contained aromatics. No. 2,444,582. Allen S. Smith to Blaw-Knox Co.
Treatment of petroleum cracking residues by soaking lumps of porous carrier material with a residue. No. 2,444,610. Emil Hene.
Process for cracking hydrocarbons by treatment of a fluid hydrocarbon with a solid granular heating agent. No. 2,444,650. George L. Johnson and William A. Hagerbaumer to Socony-Vacuum Oil Co., Inc.
Removing vaporous reactants from catalyst used in hydrocarbon conversion. No. 2,444,832. Robert W. Krebs to Standard Oil Development Co.
Production of aromatics by thermal cracking in the presence of steam. No. 2,444,855. Robert M. Shepardson and Roy L. Mathiasen to Standard Oil Development Co.
Lubricant to inhibit deterioration. No. 2,444,947. John M. Musselman and Herman P. Lankelma to Standard Oil Co.
Lubricant. No. 2,444,948. John M. Musselman and Herman P. Lankelma to Standard Oil Co.
Cracking hydrocarbons in the presence of powdered cracking catalyst. No. 2,444,990. Charles E. Hemminger to Standard Oil Development Co.
Alkylation of a low-boiling isoparaffin with an olefin in the presence of hydrogen fluoride as a catalyst. No. 2,445,217. Frederick E. Frey to Phillips Petroleum Co.
Conversion process for heavy hydrocarbons. No. 2,445,328. Percival C. Keith to Hydrocarbon Research, Inc.
Catalytic reforming of hydrocarbon mixtures in the presence of a catalyst. No. 2,445,345. Alva C. Byrns to Union Oil Co. of Calif.
Regeneration of catalyst for the conversion of hydrocarbons. No. 2,445,-351. Edwin J. Gohr to Standard Oil Development Co.
Aviation fuel consisting of methylenecyclobutane and hydrocarbons boiling in the gasoline boiling range. No. 2,445,360. Pharis Miller to Standard Oil Development Co.
Stabilizing hydrocarbons with a diolefin containing dissolved therein a phenolic type antioxidant and methylene blue chloride. No. 2,445,367. Richard F. Robey, John Fedirko and Allen E. Barnett to Standard Oil Development Co.
Catalytic cracking of hydrocarbon oils with activated clays. No. 2,445,370. William E. Spicer and Jerry A. Pierce to Standard Oil Development Co.
Alkylation of isoparaffins with olefins in the vapor phase catalyzed by hydrogen fluoride. No. 2,445,560. Hamilton P. Caldwell, Jr., to Socony-Vacuum Oil Co., Inc.
Distillation of sulfuric acid treated hydrocarbon oils. No. 2,445,655. Harry L. Allen and Herbert G. Kleinguenther to Allied Chem. & Dye Corp.
Alkylating hydrocarbons with an olefin by contacting with a condensation catalyst. No. 2,445,824. Frederick E. Frey, Paul V. McKinney and William H. Wood to Phillips Petroleum Co.
Desalting mineral oils by diluting the oil with a hydrocarbon solvent. No. 2,446,040. Charles M. Blair, Jr., to Petrolite Corp., Ltd.
Synthesis of hydrocarbons by the catalytic reduction of carbon monoxide with hydrogen in the presence of an iron catalyst containing sulfur. No. 2,446,426. Edwin T. Layng to Hydrocarbon Research, Inc.
De-salting water- and salt-bearing oils. No. 2,446,456. Otis L. Branson to Socony-Vacuum Oil Co., Inc.
Regenerating spent internal-combustion engine lubricating oils by percolating through a bed of activated bauxite. No. 2,446,489. Albert Schaafsma to Shell Development Co.
Separation of hydrocarbon mixtures by solvent treating. No. 2,446,514. Hall Stewart and August A. Schaerer to Shell Development Co.

Canadian

Cracking petroleum oil to produce motor fuel by contacting the oil at a cracking temperature with a catalyst in the form of an aerogel. No. 450,468. John W. Teter to Sinclair Refining Co.
Improved Diesel fuel comprising a fuel oil and a small proportion of a dinitrate of a poly 1,2 alkylene glycol. No. 450,574. George O. Curme, Jr., to Carbide & Carbon Chem., Ltd.
Cyclic process for the manufacture of high anti-knock motor fuel from low-boiling hydrocarbons containing isobutane, normal butane and olefins. No. 450,614. Arthur Raymond Goldsby and Frank Henry Bruner to Texaco Development Corp.
Alkylation of isoparaffins with ethylene. No. 450,616. William E. Bradley to Union Oil Co. of Cal.
Extracting weakly acidic substances from hydrocarbon distillates by contacting with a solution of an alkali metal hydroxide and a solutizer comprising an alkali metal salt of a polyether acid. No. 450,754. Chester E. Adams and Theodore B. Tom to Standard Oil Co.
Catalytic polymerization of unsaturated **hydrocarbons.** No. 450,756. Frank John Soday to United Gas Improvement Co.
Acid activated sub-bentonite montmorillonite clay having a base exchange capacity within the range of about 30-90 milli-equivalents per 100 grams of volatile-free clay impregnated with hydrated alumina, having a catalytic efficiency in the cracking of petroleum in excess of four times the catalytic efficiency of the native clay. No. 450,881. Frederick Junior Ewing to Filtrol Corp.
Process of making high grade motor fuel from napthas in the boiling range of 200-420 F. No. 450,900. Eugene Jules Houdry to Houdry Process Corp.

Photographic

Light sensitive blueprint material. No. 2,443,844. Matheus Marinus Paulus Vallen and Jan Matheus Henricus van den Dolder to Chemische Fabriek L. van der Grinten.
Stabilizers for photographic emulsions. No. 2,444,606. Newton Heimbach and Walter Kelly, Jr., to General Aniline & Film Corp.
Stabilizers for photographic emulsions. No. 2,444,607. Newton Heimbach to General Aniline & Film Corp.
Stabilizers for photographic silver-halide emulsions. No. 2,444,608. Newton Heimbach and Walter Kelly, Jr., to General Aniline & Film Corp.

Stabilizers for photographic silver-halide emulsions. No. 2,444,609. Newton Heimbach and Robert H. Clark to General Aniline & Film Corp.
Photographic developer containing disodium salts of monohydric phenol monoacids. No. 2,444,803. Frederic R. Bean to Eastman Kodak Co.

Polymers

Polyethylene isopropylene sebacate adhesive compositions. No. 2,443,613. Calvin S. Fuller to Bell Telephone Laboratories, Inc.
Emulsion copolymerization of unsaturated alkyd resins. No. 2,443,735. Edward L. Kropa to American Cyanamid Co.
Copolymer of diallyl phthalate and unsaturated alkyd resin. No. 2,443,736. Edward L. Kropa to American Cyanamid Co.
Resinous composition produced by polymerization of diallyl maleate and a polymerizable esterification product of a polyhydric alcohol. No. 2,443,738. Edward L. Kropa to American Cyanamid Co.
Copolymer of modified unsaturated alkyd resin and polyallyl ester. No. 2,443,739. Edward L. Kropa to American Cyanamid Co.
Unsaturated alkyd resins and polyallyl esters. No. 2,443,740. Edward L. Kropa to American Cyanamid Co.
Polymerizable compositions containing unsaturated alkyd resins and allyl esters, copolymers of such. No. 2,443,741. Edward L. Kropa to American Cyanamid Co.
Catalytic copolymerization of isobutylene and isoprene. No. 2,443,817. Arthur A. Draeger and Henry G. Schutze to Standard Oil Development Co.
Wax resin compositions. No. 2,443,887. George J. Bohrer to General Electric Co.
Synthetic waxes. No. 2,443,888. George J. Bohrer to General Electric Co.
Stable emulsions of resinous materials. No. 2,443,893. Henry Michael Collins to Shawinigan Chemicals, Limited.
Polymeric beta-hydroxyethylsilanol of the unit formula $HOC_2H_4SiO_{3/2}$ prepared by reacting ethylene with silicon tetrachloride in the presence of an aluminum chloride-mercuric oxide-mercuric chloride catalyst followed by hydrolysis. No. 2,443, 898. Ellsworth Knowlton Ellingboe to E. I. du Pont de Nemours & Co.
Preparation of dialkyl-substituted dihalogenosilanes by reaction between heated silicon and an alkyl halide in the presence of a finely divided cupreous powder. No. 2,443,902. Charles S. Ferguson and Jesse E. Sellers to General Electric Co.
Sulfonated crotonaldehyde-rosin reaction product. No. 2,443,913. Ernest Paul Irany to Shawinigan Chemicals, Ltd.
Copolymer of styrene with an ester of an unsaturated dicarboxylic acid and an hydroxy acid esterified with an unsaturated alcohol. No. 2,443,-915. John Leslie Jones to Libbey-Owens-Ford Glass Co.
Polyvinyl alcohol esters of mercapto carboxylic acids. No. 2,443,923. Carl Walter Mortenson to E. I. du Pont de Nemours & Co.
Gasket cement containing polyvinyl butyral and polyvinyl acetate. No. 2,443,998. Chester M. White to Genesee Research Corp.
Resin coated fiber base. No. 2,444,094. Fred W. Duggan to Bakelite Corp.
Thermosetting synthetic resins by the polymerization of alkylene oxide derivatives. No. 2,444,333. Pierre Castan to De Trey Freres S. A.
Stable polyvinyl acetate emulsions. No. 2,444,396. Henry Michael Collins and George Osman Morrison to Shawinigan Chemicals, Ltd.
Polymerization of butadiene-1,3 hydrocarbons in acidic aqueous emulsion in the presence of a persulfate and aluminum chloride. No. 2,444,643. Charles F. Fryling to B. F. Goodrich Co.
Light polarizing polyvinyl orthoborate films. No. 2,444,712. Frank Kerr Signaigo to E. I. du Pont de Nemours & Co.
Alkylated silanes by reaction under heat. No. 2,444,784. Robert N. Meals to General Electric Co.
Nitrogenous resins containing alkylene sulfonate groups. No. 2,444,802. Robert W. Auten and James L. Rainey to Resinous Products & Chemical Co.
Copolymers of vinyl furane and alpha-alkyl acrylonitrile. No. 2,444,807. Albert M. Clifford to Wingfoot Corp.
Polymerizing vinyl compounds in the presence of benzoyl peroxide. No. 2,444,817. Reid G. Fordyce to Monsanto Chemical Co.
Continuous polymerization of isobutylene in the presence of an aluminum halide. No. 2,444,848. R. L. Purvin to Standard Oil Development Co.
Trimethylsilylmethylpentathyldisiloxane. No. 2,444,858. John L. Speier to Corning Glass Works.
Copolymers of butadienes-1,3 and alpha aryl acrylonitriles. No. 2,444,870. Albert M. Clifford to Wingfoot Corp.
Preservation of 1,3-diene copolymers with mono-substituted thioureas. No. 2,444,881. Robert R. Sterrett to U. S. Rubber Co.
Polymers and copolymers of acenaphthylene. No. 2,445,181. Harry F. Miller and Ralph G. Flowers to General Electric Co.
Polymerization of unsaturated compounds in the presence of a peroxide and a hydrogen halide. No. 2,445,189. Edward C. Shokal to Shell Development Co.
Mixed polysulfide condensation product. No. 2,445,191. Theodore A. Te Grotenhuis and Gilbert Holm Swart to General Tire & Rubber Co.
Deashing sulfonated coumaroneindene resins with a solvent for pure still residues. No. 2,445,193. Andries Voet to Neville Co.
Curing olefin-diolefin copolymers. No. 2,445,283. Robert R. Sterrett to U. S. Rubber Co.
Vanillyl alcohol-formaldehyde resins. No. 2,445,292. Harry F. Lewis and Irwin A. Pearl to Sulphite Products Corp.
Alkoxypolyolefin polymers. No. 2,445,378. David W. Young and Norman M. Elmore to Standard Oil Development Co.
Polymerizng dialkoxydiolefins and isoolefins. No. 2,445,379. David W. Young and Norman M. Elmore to Standard Oil Development Co.
Polymethylene dihydrazine from an unsubstituted alkylene dihalide and hydrazine. No. 2,445,518. Henry Dreyfus, deceased, by Claude Bonard, administrator, to Celanese Corp. of America.
Light-Polarizing polyvinyl sheet. No. 2,445,555. Frederick J. Binda to Polaroid Corp.
Stabilizing organo-substituted polysiloxanes with metal salt of an organic carboxylic acid. No. 2,445,567. John R. Elliott to General Electric Co.
Light-polarizing complex of iodine and a polyvinyl compound with protective surface boric acid-polyvinyl compound complex. No. 2,445,579. Mark Hyman, Jr., and Cutler D. West to Polaroid Corp.
Polymer of diallyl 3-methyl-1,2,3,6-tetrahydrophthalate. No. 2,445,627. Rupert C. Morris, Robert M. Horowitz and Alva V. Snider to Shell Development Co.
Recovery of paracoumarone type resins from polymerized resin oil by distilling. No. 2,445,654. Harry L. Allen and Herbert G. Kleinguenther to Allied Chem. & Dye Corp.
Moistureproof film comprising an elastomeric copolymer of butadiene-1,3 and acrylonitrile and a resin selected from the group consisting of homopolymers of vinyl chloride, copolymers thereof with vinyl acetate and copolymers thereof with vinylidene chloride. No. 2,445,727. Siegfried M. Kinzinger to Firestone Tire & Rubber Co.
Stabilization of copolymers with reaction products of sulfur dichloride, and aldehyde, and phenol. No. 2,445,736. Gordon W. Gottschalk to Firestone Tire & Rubber Co.
Stabilization of dichlorobutadiene resins. No. 2,445,739. George P. Rowland, Jr. and Robert J. Reid to Firestone Tire & Rubber Co.
Interpolymer of diallyl maleate and diethylene glycol maleate phthalate. No. 2,445,764. Gaetano F. D'Alelio to General Electric Co.
Methyl silicone elastomers containing si-bonded vinyl radicals. No. 2,445,794. James Marsden to General Electric Co.
Organic sulfur-containing polymers of an ester of tetrahydrothiophene-3-ol-1,1-dioxide with an acid carbonate of an aliphatic, monohydric, mono-olefinic alcohol. No. 2,445,799. Rupert C. Morris and Edward C. Shokal to Shell Development Co.
Apparatus for cooking resins. No. 2,445,919. William Arthur Mitchell.
Pulverulent noncoalescent dispersion of a plastic. No. 2,445,928. Albert Sommer.
Method for polymerizing in an aqueous suspension. No. 2,445,970. Robert C. Reinhardt to Dow Chem. Co.
Copolymers of isopropenyl toluene and acrylate. No. 2,446,049. Edward L. Kropa to American Cyanamid Co.
Polymeric plasticizers and organic plastic materials. No. 2,446,121. David E. Adelson and Hans Dannenberg to Shell Development Co.
Preparing methyl siloxanes. No. 2,446,135. James Franklin Hyde to Corning Glass Works.
Soluble polymers of unsaturated esters of polycarboxylic acids. No. 2,446,314. John K. Wagers and Edward C. Shokal to Shell Development Co.
2-fluoro-1,3-diene polymers. No. 2,416,382. Walter E. Mochel to E. I. du Pont de Nemours & Co.
Cellular phenolic resin. No. 2,446,429. John D. Nelson and Paul Steenstrup to General Electric Co.

Canadian

Polymeric chemical compound comprising monovalent saturated aliphatic and divalent aryl radicals linked to silicon atoms, each of a plurality of the divalent aryl radicals being linked to two different silicon atoms. No. 450,405. Eugene G. Rochow to Canadian General Electric Co., Ltd.
Preparing **organosilicon halides** by effecting reaction between silicon and hydrocarbon halide. No. 450,406. Eugene G. Rochow to Canadian General Electric Co., Ltd.
Effecting reaction between heated silicon and a gaseous mixture of hydrogen and an alkyl halide selected from the group consisting of alkyl chlorides and alkyl bromides containing not more than three carbon atoms in the alkyl radical. No. 450,407. Murray M. Sprung and William F. Gilliam to Canadian General Electric Co., Ltd.
Process of producting a mechanically stabilized shape of polystyrene. No. 450,444. James Bailey and Fred Edwin Wiley to Flax Corp.
Producing a resin by reacting an alkyl phenol having at least 4 carbon atoms in the alkyl group and formaldehyde in water solution in the presence of a small amount of acid catalyst and of a small amount of surface active wetting agent at a temperature from 180° to 210° F. No. 450,467. James V. Hunn to Sherwin-Williams Co.
Preparing aqueous phenolic resin solutions by reacting formaldehyde with a tar acid containing at least 13 per cent cresols, and mixing the resultant reaction product with water and formaldehyde to form a solution containing no more than about 30% of the resin reaction product and an amount of formaldehyde to make the mixture homogenous. No. 450,521. Dee Alton Hurst to Allied Chem. & Dye Corp.
Effecting reaction at an elevated temperature between silicon and a halogenated hydrocarbon in the presence of an inert gas. No. 450,530. Murray M. Sprung and William F. Gillian to Canadian General Electric Co., Ltd.
Organosilicon compound, $X_3Si(CH_2)_nSiX_2Y$ where X represents a halogen atom, Y represents an atom selected from the group consisting of hydrogen and a halogen atom of the same type as that represented by X and n is an integer and is at least 1 and not more than 4. No. 450,531. Winton I. Patnode and Robert W. Schiessler to Canadian General Electric Co., Ltd.
Effecting reaction between heated silicon and carbon tetrachloride in the presence of a metallic catalyst for the reaction to produce tetrachloroethylene and chlorosilane. No. 450,532. Winton I. Patnode and Robert W. Schiessler to Canadian General Electric Co., Ltd.
Polymerizing a halogen-substituted 1,3-butadiene containing not more than 3 halogen atoms in the presence of a di-ester of an aliphatic alpha-unsaturated alpha-beta-dicarboxylic acid and a monohydric unsaturated alcohol which alcohol contains up to 10 carbon atoms. No. 450,540. Charles Joseph Mighton to Canadian Industries, Ltd.
Synthetic rubber-like material by interpolymerization of a compound of the class consisting of butadiene-1,3,2-chloro-butadiene-1,3 and their methyl and dimethyl homologues, and a compound of the class consisting of chlorocyano-butadiene-1,3, and its methyl homologues. No. 450,541. Herbert Gudgeon, Elias Isaacs and William McGillivray Morgan to Canadian Industries, Ltd.
Polymerization of a normally gaseous monoolefin, the step which comprises carrying on the polymerization of such a monoolefin at a temperature of from 20 to 400° C. under an elevated pressure between 150 and 3000 atmospheres in the presence of 0.001 to 5.0% by weight of a catalyst selected from the class consisting of hydrazines and hydrazinium compounds. No. 450,542. William Edward Hanford to Canadian Industries, Ltd.
In a continuous process for homopolymerizing ethylene at a pressure above at least 1,000 atmospheres the steps which comprise passing ethylene together with a dialkyl dioxide of the formula ROOR′ in which R and R′ are simple unsubstituted alkyl groups, containing from 1 to 3 carbon atoms into a reaction zone of relatively great length to diameter, conducting the reaction therein at a temperature between 205 and 300° C. and with a contact time of not more than thirty minutes. No. 450,547. M. D. Peterson to Canadian Industries, Ltd.
Self-sustaining film of polyvinyl alcohol containing from 0.1% to 10% by weight of cetyl dimethyl benzyl ammonium chloride. No. 450,555. Max Vernon Noble to Canadian Industries, Ltd.
Coating composition stabilized against decomposition on heating comprising an artificial resin containing polymerized vinyl chloride associated with from about 0.5 to about 10 parts of a stabilizing ingredient per 100 parts of the artificial resin, said stabilizing ingredient comprising a resin containing substantially no basic amino groups, resulting from the condensation of formaldehyde with an amide of the group consisting of urea and melamine. No. 450,573. George M. Powell and William H. McKnight to Carbide & Carbon Chemicals, Ltd.
Manufacture of chlorinated polythenes. No. 450,597. James Robertson Myles and Philip James Garner to Imperial Chem. Industries, Ltd.
Silicon compound having the formula $(Cl_3SiCH_2)_x$ wherein x is equal to at least 3. No. 450,690. Winton I. Patnode and Robert W. Schiessler to Canadian General Electric Co., Ltd.
Milling a mixture containing an elastic polychloroprene and n-butyl ammonium propionate. No. 450,708. Louis Harold Howland to Dominion Rubber Co., Ltd.
Subjecting polymerizable material consisting of at least one unsaturated organic compound which contains a $CH_2{=}C{<}$ group to polymerization

in aqueous emulsion in the presence of a catalyst comprising a water-soluble heavy metal salt combined with an aliphatic keto substituted carboxylic acid. No. 450,888. William D. Stewart to B. F. Goodrich Co.

Polymerizing a conjugated butadiene hydrocarbon in an aqueous emulsion in the presence of a tetra-alkyl thiuram sulphide in which the alkyl groups contain a total of at least 12 carbon atoms. No. 450,889. George Landon Browning, Jr., to B. F. Goodrich Co.

Polymerizing butadiene in aqueous emulsion in a vessel in which the surfaces contacting the emulsion are constructed of an alloy containing 80-70% nickel, 15-20% chromium, and 5-10% iron. No. 450,890. Waldo L. Semon to B. F. Goodrich Co.

In polymerizing a monomeric mixture containing a conjugated butadiene and an unsaturated organic compound copolymerizable therewith, adding an aliphatic diazo compound containing the diazo grouping—N=N— linked by two valencies to a single carbon atom to the monomeric material before polymerization. No. 450,891. Waldo Lonsbury Semon and Charles Frederick Fryling to B. F. Goodrich Co.

Subjecting a monomeric material comprising a conjugated butadiene, to polymerization in aqueous emulsion in the presence of a heavy metal catalyst obtained by the combination of a water-soluble heavy metal salt and a saturated aliphatic carboxylic acid selected from the class consisting of saturated aliphatic carboxylic acids having a primary amino group in alpha position to a carboxyl group and being composed, in addition to primary amino and carboxyl, of saturated aliphatic structure made up exclusively of atoms of carbon, hydrogen and oxygen, all oxygen being present in hydroxy, and saturated aliphatic carboxylic acids having a primary amino group in alpha position to a carboxyl group and being composed, in addition to primary amino and carboxyl of saturated aliphatic structure made up exclusively of atoms of carbon and hydrogen. No. 450,892. William D. Stewart to B. F. Goodrich Co.

Subjecting a conjugated butadiene to polymerization in aqueous emulsion in the presence of a heavy metal catalyst obtained by the combination of a water soluble heavy metal salt and an aliphatic polycarboxylic acid containing from 2-3 carboxyl groups and no additional structure other than aliphatic structure in which there is present, in addition to hydrocarbon structure, no structure other than hydroxy. No. 450,893. William D. Stewart to B. F. Goodrich Co.

Leather, hides and skins having incorporated therein solid waxy polyethylene resin composition having a melting point in the range of approximately 85-115° C. No. 450,944. Jacob Pomeraniec and Fritz Uhlfelder to Tanoplastics Research, Ltd.

Insulated conductor with a layer of fibrous material impregnated with a plastic mixture consisting of substantially unconverted ester gums and a plasticizer surrounding the conductor. No. 450,952. Samuel Edward Brilhart and Alvin Nelson Gray to Western Electric Co., Inc.

Monomeric vinyl chloride interpolymerized with monomeric 1,2,3-tricarballoxyisopropyl allyl carbonate. No. 450,966. Charles R. Milone to Wingfoot Corp.

Composition impervious to liquid hydrocarbons which comprises a woven fabric of cold-drawn polyamide fibre impregnated with a polyamide interpolymer. No. 450,968. Charles W. Taylor to Wingfoot Corp.

Processes and Methods

Apparatus for converting liquids into gases and for dispensing the gases. No. 2,443,724. Alois Cibulka.

Reactivating finely divided contact material. No. 2,444,128. Nils K. Anderson to Universal Oil Products Co.

Galvanic coating process. No. 2,444,174. Alan L. Tarr, George W. Oxley, and Frank C. Fyke to Standard Oil Development Co.

Heating granular solid heat transfer material. No. 2,444,274. Ernest Utterback to Socony-Vacuum Oil Co., Inc.

Measuring the state of compression of a liquid in a liquid vapor phase system. No. 2,444,358. Alfred A. Markson and Robert R. Donaldson to John M. Hopwood.

Distillation of mixtures forming two liquid phases. No. 2,445,043. Mott Souders, Jr., and Alexander J. Cherniavsky to Shell Development Co.

Drying of frozen materials by heat radiation. No. 2,445,120. Sidney O. Levinson and Franz Oppenheimer to Michael Reese Research Foundation.

Evaporative cooling of liquids. No. 2,445,199. Allan E. Williams to Niagara Blower Co.

Electrostatically separating particles. No. 2,445,229. T. J. Masse.

Fluidizing process for gasifying carbonaceous solids. No. 2,445,327. Percival C. Keith to Hydrocarbon Research, Inc.

Extracting alcohol-soluble oils from vegetable seeds and nutmeats. No. 2,445,931. Arthur C. Beckel, Paul A. Belter, and Allan K. Smith to U. S. A., represented by Secy. of Agriculture.

Separation and purification of gases by passing the gaseous mixture over a vertical column of finely-divided solids capable of selectively removing constituents. No. 2,446,076. Donald L. Campbell, Homer Z. Martin, Eger V. Murphree and Charles W. Tyson to Standard Oil Development Co.

Exothermic catalytic reactions wherein a vapor **is contacted** with a fluidized, solid, finely divided catalyst. No. **2,446,247.** Fred W. Scheineman to Standard Oil Co.

Canadian

Method of dehydration of materials by hot gases characterized in that the material in drying follows a continuous circulating and axially progressive path through a hot zone, a zone of falling temperature, and a zone in which the dried material is separated from the gases. No. 450,680. Oswald Heller to Bamag, Ltd.

Removal of colloidal particles from a liquid dispersion medium by contacting a liquid containing colloidal particles with an insoluble, anion active material. No. 450,840. Robert Bowling Barnes and Garnet Philip Ham to American Cyanamid Co.

Rubber

Chlorinated rubber cements. No. 2,443,678. Benjamin S. Garvey to B. F. Goodrich Co.

Vulcanization of chloroprene elastomers. No. 2,444,546. Robert Henry Walsh to E. I. du Pont de Nemours & Co.

Increasing the particle size of synthetic rubber latex and forming a film therefrom. No. 2,444,689. Edward A. Willson to B. F. Goodrich Co.

Creaming of synthetic rubber latices. No. 2,444,801. Erving Arundale to Standard Oil Development Co.

Sponge rubber from fluid foam of a synthetic rubber latex. No. 2,444,869. William J. Clayton and Paul V. Butsch to U. S. Rubber Co.

Vulcanization accelerator. No. 2,445,722. Edward L. Carr and George E. P. Smith, Jr. to Firestone Tire & Rubber Co.

Vulcanization accelerator. No. 2,445,724. George E. P. Smith, Jr., to Firestone Tire & Rubber Co.

Synthetic rubber composition containing a reaction product of sulfur dichloride, an aldehyde and an alkyl phenol. No. 2,445,737. Harry E. Albert to Firestone Tire & Rubber Co.

Aqueous rubber dispersions having dissolved a water-soluble salt of a propylated naphthalene sulfonic acid together with a sulfosuccinamate. No. 2,445,740. Arnold R. Davis to American Cyanamid Co.

Creaming of synthetic rubber latices. No. 2,446,101 Charles R. Peaker to U. S. Rubber Co.

Creaming of synthetic rubber latices. No. 2,446,107. John S. Rumbold to U. S. Rubber Co.

Creaming of synthetic rubber latices. No. 2,446,115. Edward C. Svendsen to U. S. Rubber Co.

Canadian

Reclaiming a composition comprising vulcanized rubber and vulcanized neoprene, said method comprising associating with said composition an aliphatic polyamine, and heating until the composition becomes plastic. No. 450,719. Richard A. Crawford to B. F. Goodrich Co.

Making a rubber product resistant to the deteriorating effects of heat which comprises incorporating in a rubber an amino alcohol, as an agent promoting heat resistance, and an organic compound having at least 2 connected sulfur atoms and being capable of giving up at least 1 of said sulfur atoms during vulcanization, and vulcanizing the product. No. 450,720. Robert Arthur Emmett to B. F. Goodrich Co.

Preparing an artificial dispersion of rubber by adding water to a plasticized reclaimed rubber mass containing zinc oxide and an ammonium soap until an inversion of phase takes place and the rubber becomes dispersed in the aqueous medium, and adding an amount of a water-soluble basic sulfide which will react with sufficient of the zinc oxide to form insoluble zinc sulfide to prevent formation of such amount of zinc ammonium complex as would destabilize the dispersion. No. 450,724. Donald Eugene Fowler to Dispersions Process, Inc.

Rubber hydrochloride film plasticized with about 30% of dimethoxyethyl phthalate to increase its impact strength. No. 450,964. Harold Judson Osterhof and LaVerne Emerson Cheyney to Wingfoot Corp.

Specialties

Alkaline aqueous cyanide plating bath electrolyte containing in solution a plating metal which forms complex cyanides and a sparingly soluble alkaline earth metal gluconate, said electrolyte normally tending to form a bath soluble alkaline carbonate during electrodeposition of the plating metal and the quantity of said gluconate therein being effective to react with and precipitate said bath soluble carbonate as an insoluble carbonate. No. 2,443,600. Allan E. Chester to Poor & Co.

Abrasive composition comprising a tacky butylene polymer, a lubricating oil, a fatty acid, and a liquid phenol-formaldehyde resin. No. 2,443,698. John Y. Snyder to Wedgeplug Valve Co., Inc.

Dust collecting composition consisting of a glycol and sorbitol. No. 2,443,766. Carl W. J. Hedberg to Research Corp.

Glycerol substitutes for an electrolytic condenser. No. 2,443,843. Karl Heinrich, Walter Tueruk and H. J. Lichenstein to Distillers Co.

Adhesive of water remoistenable type from lignin sulfonic acid and polyvinyl alcohol. No. 2,443,889. Donald S. Bruce and Howard L. Heise to Gummed Products Co.

Electrically conducting adhesive. No. 2,444,034. Norman Hixon Collings and Raymond John Heaphy Beverton to Standard Telephones and Cables, Ltd.

Parasiticidal composition. No. 2,444,154. Roy Cross to Kansas City Testing Laboratory.

Product for inhibiting hydrous disintegration of shale. No. 2,444,359. Norman E. Martello to Hall Laboratories, Inc.

Mannogalactan mucilages. No. 2,444,412. John W. Swanson to Institute of Paper Chemistry.

Heat transfer media. No. 2,444,555. William Herbert Daudt to Corning Glass Works.

Making a purifying agent from steer bones. No. 2,444,571. Francis Leslie.

Lithium base greases by contacting a free soap-forming acid in solution in a lubricating oil with an approximately equivalent quantity of a saponifying agent of the group consisting of lithium oxide, anhydrous lithium hydroxide, lithium hydroxide and its hydrates. No. 2,444,720. James Alfred Bell to Shell Development Co.

Particles coated with 2,2-bis-(parachlorophenyl)-1,1,1-trichloroethane. No. 2,444,752. Edouard H. Siegler.

Detergent briquette. No. 2,444,836. James Douglas MacMahon to Mathieson Chemical Corp.

Detergent briquette. No. 2,444,837. James Douglas MacMahon to Mathieson Chemical Corp.

Grease compositions. No. 2,444,970. John C. Zimmer and Gordon W. Duncan to Standard Oil Development Co.

Welding flux containing sodium carbonate, sodium sesquicarbonate, sodium chloride, calcium fluoride, borax glass. No. 2,444,994. Kenneth H. Koopman to Haynes Stellite Co.

Dispersing keratin proteins with amides. No. 2,445,028. Chase B. Jones and Dale K. Mecham to U. S. A., as represented by Secretary of Agriculture.

Dispersing keratin protein with ammonium thiocyanate. No. 2,445,029. Chase B. Jones and Dale K. Mecham to U. S. A., as represented by Secretary of Agriculture.

Adhesive sheet. No. 2,445,553. Ellington M. Beavers to The Resinous Products & Chemical Co.

Soda base grease. No. 2,445,935. Arnold A. Bondi to Shell Development Co.

Waterproofing of lubricating greases. No. 2,445,936. Richard August Butcosk to Shell Development Co.

Surface-active hydrophile chemical. No. 2,446,045. Melvin De Groote and Bernhard Keiser to Petrolite Corp., Ltd.

Silicone grease. No. 2,446,177. George M. Hain and William A. Zisman.

Fire extinguisher fluid. No. 2,446,272. Michael O. Farris, John M. O'Connor and Richard B. Gottschalk to Lockheed Aircraft Co.

Inhibiting the growth of mold. No. 2,446,505. Simon Weil Arenson to Doughnut Corp. of America.

Canadian

Producing a scent fixative by treating the leafy portion of Myrica Asplenifolia with petroleum ether. No. 450,388. Maurice Yves Sandoz.

Press-stable typographic printing ink vehicle comprising at least 50% by weight of a water-soluble polyhydric alcohol compatible with aqueous alkali silicate, the residue of the composition consisting essentially of a minor proportion of water and a major proportion of alkali silicate. No. 450,429. Albert E. Gessler to Interchemical Corp.

Improving the process of bleaching vegetable-tanned leather which comprises treating the tanned skins in an aqueous alkaline solution to which a small amount of a molecularly dehydrated phosphate has been added. No. 450,595. Eric T. Laurin to Hall Laboratories, Inc.